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**'PROGRAMMED INSTRUCTION FOR CREATIVITY'**

**R. E. WILLIAMS**

**Thesis submitted for degree of  
Doctor of Philosophy**

**University of Keele**

**1975**

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# ABSTRACT

## 'PROGRAMMED INSTRUCTION FOR CREATIVITY'

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The aim of the research was to discover if it was possible to use Programmed Instructional methods to increase Creative Ability; with particular reference to the visual creative field.

Test instruments for measuring creative ability were found by correlating scores on possible test instruments with scores on Art Works judged for creativity. The Torrance Tests of Creative Thinking (Figural Form: Originality and Elaboration scores) were found to be indicators of levels of creative ability. The subjects involved in this section of the research were eighty-six pupils (males and females: 1st and 3rd Years) of a rural secondary school in England.

A Creativity Programme was developed that was administered to an experimental form of 3rd Year pupils during the normal school timetable. A second 3rd Year form was used as a control group: normal teaching methods were used with this group.

The Creativity Programme was comprised of a number of Elements and Units which led the learners from the evaluation of products - as more creative or less creative - through the acquisition of knowledge concerning the creative personality and creative processes to the use of the 'deferred judgement' method of solving problems creatively. Finally the learners used this method to produce a painting.

Following the administration of the programme to the experimental group of 3rd Year male and female pupils (they were 1st Year pupils when the test instruments had been selected), the Tests and Art Works were administered as post-tests to both 3rd Year groups. The scores obtained when the pupils were 1st Years were used as pre-test data.

The data gathered from the pre-test and post-test administrations



were analysed. The main instrument for analysis being the Analysis of Variance. The differences between the means for the control and experimental groups, males and females, from the first test administration to the second test administration were found to be significant.

These differences between the means indicated that the experimental group had increased its creative ability, as measured by the test instruments. It was concluded that in all probability this increase was due to the intervening administration of the Creativity Programme; and that there were grounds for believing that it was possible to increase Creative Ability through the use of Programmed Instructional methods.

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# TABLE OF CONTENTS

<u>CHAPTER NUMBERS AND HEADINGS</u>	<u>PAGE No.</u>
<u>PART ONE INTRODUCTION AND DEVELOPMENT OF HYPOTHESES</u>	
CHAPTER ONE: INTRODUCTION AND OUTLINE OF RESEARCH	1
CHAPTER TWO: STATEMENT OF PROBLEM AREA	7
CHAPTER THREE: REVIEW OF LITERATURE	13
CHAPTER FOUR: DEVELOPMENT OF HYPOTHESES	108
<u>PART TWO STUDY TO TEST HYPOTHESIS A</u>	
CHAPTER FIVE: INTRODUCTION - DESIGN OF THE STUDY: SUBJECTS, TESTS, AND CRITERIA FOR SCORING ART WORKS	112
CHAPTER SIX: ADMINISTRATION PROCEDURES	132
CHAPTER SEVEN: SCORING TESTS AND ART WORKS	138
CHAPTER EIGHT: RESULTS AND DATA ANALYSIS	146
CHAPTER NINE: DISCUSSION OF RESULTS	160
<u>PART THREE DEVELOPMENT OF THE CREATIVITY PROGRAMME</u>	
CHAPTER TEN: PREPARATION AND CHOICE OF RELEVANT FACTORS	169
CHAPTER ELEVEN: SELECTION OF OBJECTIVES: STRATEGY	192
CHAPTER TWELVE: PROGRAMME CONSTRUCTION	203
CHAPTER THIRTEEN: OTHER CONSIDERATIONS	218
<u>PART FOUR STUDY TO TEST HYPOTHESIS B</u>	
CHAPTER FOURTEEN: INTRODUCTION - DESIGN OF THE STUDY: SUBJECTS AND PRE-TESTS	221
CHAPTER FIFTEEN: ADMINISTRATION OF THE PROGRAMME	225
CHAPTER SIXTEEN: POST-TESTS: ADMINISTRATION	237
CHAPTER SEVENTEEN: POST-TESTS: SCORING AND COMPARISONS: EXAMINATION OF PROGRAMME FEEDBACK	240
<u>PART FIVE DATA PROCESSING, STATISTICAL ANALYSES AND CONCLUSION</u>	
CHAPTER EIGHTEEN: DATA PROCESSING	255
CHAPTER NINETEEN: ANALYSES OF DATA: RESULTS	260
CHAPTER TWENTY: CONCLUSION	297
REFERENCES	301
Duplicate page of 'APPENDIX: TABLE OF CONTENTS' (for reference)	315

## CHAPTER ONE

INTRODUCTION AND OUTLINE OF RESEARCHINTRODUCTION

There can be little doubt that the 'progress' made by mankind, from the cave to the present day, is due to his 'creativity'; his ability to utilize the knowledge, gained by accidental or scientific discovery, in creating artifacts, theories, societies etc. Until the present century, however, little concentrated research has been done in the field of 'creativity'. It was usually accepted as some uncontrollable, mysterious phenomenon. The statement 'Artists are born, not made' is probably typical of the attitude society adopted toward creative ability.

This situation is changing, and research into the factors responsible for high levels of creativity has extended our knowledge to such an extent that attempts have now been made to increase creative ability in industry, commerce, and education.

The developing technology of education has recently been stimulated by programmed instructional methods. The concepts and theories involved in the early days of 'programmed learning' have evolved into flexible auto-instructional methods that may be used in many fields of learning.

It is possible that programmed instruction may be used to increase creativity. The research that is the topic of this thesis is concerned with such an attempt, with particular emphasis on the increase of creative ability in the visual art field in education.

OUTLINE OF RESEARCH

The analysis of the problem revealed that three objectives were involved in this research:

1. The selection or development of instruments that could 'measure' creative ability, with special reference to 'visual art'.
2. The selection or development of a programmed instructional method for increasing creative ability, particularly in the visual arts.

3. The 'testing' of the effectiveness of such a programme, using measures found as a result of attaining the first objective.

The realization of the objectives entailed five stages:

#### STAGE ONE

Two parts were involved in this stage: A. The review of literature in the fields of creativity and programmed instruction, and

B. The development of hypotheses.

A. Review of Literature. The review of the literature in the areas of 'creativity' and 'programmed instruction' was considered in the following sections:

##### 1. Creativity

- a) Areas of general definition - the creative person - the creative process - the creative product.
- b) Tests and measuring instruments concerned with creativity in the areas of the visual arts, the creative personality, and creativity itself.
- c) Methods that had been used in attempts to increase creativity.

##### 2. Programmed Instruction

Following a brief survey of 'classical' programmed learning in the early stages, two main areas were examined:

- a) Developing concepts in Programmed Instruction; considered in the areas of Skinner's five steps - linear sequence, small steps, active overt response, immediate knowledge of results, and self spacing - plus evaluation and other developments.
- b) Programmed Instructional methods used in attempts to increase creativity.

B. Development of Hypotheses. From the analysis of the problem area and the review of the literature, it was found necessary to test two 'hypotheses':

1. Hypothesis 'A': Creativity, including creativity in the visual art field, can be measured by means of test instruments.
2. Hypothesis 'B': Programmed Instruction can be used to increase creativity, including creativity in the visual art field, as measured by the use of test instruments.

The testing of Hypothesis B was dependent upon the findings from the testing of Hypothesis A.

#### STAGE TWO

This stage was concerned with the study to test Hypothesis A. It was decided to compare the scores obtained from selected tests of creativity

with the scores on 'art works' rated for creativity. If the scores of the creativity measures correlated significantly with the art work scores, then they could be used to detect any change in creativity resulting from the administration of a creativity programme.

The design of the study involved the following:

- 1) The subjects. These were eighty-six, 1st and 3rd Year, Male and Female, rural, secondary school pupils.
- 2) The 'creativity' measures. Those selected were the Torrance Tests of Creative Thinking (TTCT: Figural Form), scored for Originality and Elaboration, and the Children's Personality Questionnaire (CPQ) and the High School Personality Questionnaire (HSPQ: equivalent form for older children) scored for Creativity and Extraversion.
- 3) The 'Art Work' performances; scored for 'creativity' on four judgements adapted or developed for the purpose. These judgements were: Gestalt, Spontaneous, Originality, and Involvement.

The tests and art works were administered to the subjects during normal 'art lessons' in a period commencing late in 1967 and finishing early in 1968. They were scored according to the appropriate criteria; and high and low scoring examples were examined. In the case of scoring some of the art works, two judges were involved; interjudge correlations were high and indicated that scoring methods were reliable. The main 'data' were computer processed using 'matrix' correlation methods, and the results analysed.

As a number of significant correlations were found, between the scores on the TTCT and the Gestalt, Originality, and Involvement Art Work judgements, the hypothesis that creativity tests could measure creative ability in the visual art field was accepted.

### STAGE THREE

The next stage in the research was the development of the 'programme' to increase creativity, with particular reference to the visual arts.

This involved three main areas:

1. The examination of relevant factors, from the review of literature:
  - a) In the fields of creativity - person, process, and product - and programmed instruction.

- b) Considerations concerning the subjects, and the environment in which the programme was to be administered.
  - c) Analysis of the problem and choice of the factors to be utilized in the programme in the areas of the creative process, evaluation of the creative product, and selected traits concerning the creative person.
2. Preliminary considerations:
- a) Selection of Objectives; in the order product, person and process.
  - b) Choice of the learning strategy: the decision was taken to use the 'direct' approach and attempt to teach what 'creativity' is, and the use of some creative processes.
  - c) The 'structure' decided upon was that the programme should be in three sections: evaluation of the creative product, recognition of the creative person, and knowledge and use of creative processes.
  - d) Subjects and 'motivational' factors.
3. Design and construction of the programme:
- a) Design of the Format. It was decided to construct the programme in three sections or 'Elements':

Element One would be concerned with instruction in creativity in the areas of: evaluation of the creative product, recognition of the creative person, and knowledge of the creative processes, including the 'brain storming' method. This Element would be comprised of three 'Units' - each of a length suitable for normal classroom use - corresponding to the three areas mentioned.

Element Two would be concerned with instruction involving knowledge of the 'brainstorming' process and use of the 'brainstorming' method. Two 'Units' would comprise this element.

Element Three would be the link to 'visual art' work, and involve the use of the 'brainstorming' process to produce a painting - the actual painting to be performed soon after the completion of this element, which was comprised of one 'Unit' only.

- b) Programme Construction. The programme was constructed according to the format described. A variety of programming devices were used, including overt and covert responses, feedback, etc..The programme was subjected to preliminary internal evaluation, using trial subjects, during its construction.

The final form of the 'Creativity' Programme' was:

Element One: 'What is Creativity?'

Unit One: 'What is a Creative Product?'

Unit Two: 'Who is likely to be a Creative Person?'

Unit Three: 'What methods do Creative Persons use to Produce Creative Products?'

## Element Two: 'Brainstorming'

Unit One: 'How to Brainstorm'

Unit Two: 'You try some Brainstorming'

### Reminder Leaflet

Information given to the learner in a sheet form as 'revision frames'. These were retained by the learner.

## Element Three: 'Brainstorm a painting'

### Appendix Sheet

A sheet of 'hints that may prove useful in increasing creative power' was given to the learner on completion of the programme.

## STAGE FOUR

This stage was the design and execution of the study to test Hypothesis B.:i.e. the effectiveness of the programme in increasing creative ability. The design chosen was that involving control and experimental groups, pre-testing, administration of treatment to experimental group, and post-testing. Several considerations and steps were involved in this stage of the research:

1. The Subjects were the two 3rd Year Forms, males and females, who had been 1st year pupils in the study to test Hypothesis A. Forty-one of these subjects remained in 1969/70 when the experiment was undertaken. It was decided to use the tests and art works performed in 1967/68 as the pre-tests, and to use the same tests - in equivalent forms - as the post-tests.
2. The programme was administered to the experimental group during normal art lessons, from late 1969 to early 1970. The experimental form worked in 'pairs' for the first two Elements. Comments, difficulties experienced, and other feedback that might be of use in programme revision, were noted during the administration. The control group had the 'normal' art lessons, and the 'class environment' was kept as normal as possible for both groups.
3. On completion of the programme the post-tests were administered. These were the TTCT, the HSPQ, and the Art Works - administered to both groups early in 1970.
4. Scoring:
  - a) The post-tests were scored in the same way as were the pre-tests. Two judges were used for scoring some of the art works as a further check on the reliability of the scoring method.
  - b) Individual examples of high and low scoring in the post-tests were noted. Also post-test examples of those subjects, whose scores had changed the most since pre-testing, were compared with examples from the previous test administration.
5. The 'programme feedback' i.e. scores and work samples provided by the subjects as they worked through the programme, was examined and briefly analysed at this point. This analysis of the internal feedback revealed that the 'error rate' - if it can be so termed in a programme with a number of 'open ended' response expectations - was reasonably low.



## STAGE FIVE

This final stage involved the statistical analysis of the data and the conclusions reached regarding Hypothesis B. The analysis was undertaken in three main areas:

1. Interjudge correlations: these were high and indicated that the art work judgements were reliable.
2. Matrix correlations were performed for the tests and art work data. Due to the 'drop-outs' the data from the pre-tests were also processed to check previous correlations. Significant results indicated that the tests were indicative of creativity in the visual field, as was found previously.
3. The 'difference of the means' between the scores on the pre and post-tests was tested by using Analysis of Variance (ANOVA). An overall ANOVA (Group x Sex x Year x Tests) was performed. As a significant overall interaction was found, and other significant interactions and factor effects, three factor ANOVA's (Group x Sex x Year) were performed for the 24 test scores involved. Significant factor effects and interactions were examined by means of graphs.

The analysis of the data revealed the following main findings:

- a) The creativity tests (TTCT) can be considered a reasonably valid measuring instrument for measuring creativity in the visual art field - as measured by the art work judgements.
- b) Females scored higher than males, and thus may be more creative as measured by the tests.
- c) The experimental group increased its scores, in the majority of tests, from the pre to post-tests; particularly in the originality scores. The control group, on the other hand, tended to decrease scoring levels from pre to post-testing.

As a result of these findings the 'null' version of Hypothesis B was rejected, due to the variance noted, at a number of points.

There were grounds for concluding that the differences between the control and experimental groups, for the pre and post-test administration were due to the effect of the Creativity Programme.

\*\*\*\*\*

## CHAPTER TWO

### STATEMENT OF PROBLEM AREA

The majority of people would agree that it is preferable to create rather than to destroy. Yet many of our institutional pressures, governmental, industrial, professional, educational etc., appear to negate rather than develop, creative activity.

Rogers(1954) has stated "Many of the serious criticisms of our culture and its trends may best be formulated in terms of the dearth of creativity. Let us state some of these very briefly:

1. In education we tend to turn out conformists, stereotypes, individuals whose education is 'completed', rather than freely creative and original thinkers.
2. Our leisure time activities, passive entertainment and regimented group action are overwhelmingly predominant, whereas, creative activities are much less in evidence.
3. In the sciences, there is an ample supply of technicians, but the number who can creatively formulate fruitful hypotheses and theories is small indeed.
4. Industry, creation is reserved for the few - the manager, the designer, the head of the research department - whereas for the many life is devoid of original or creative endeavour.
5. In individual and family life the same picture holds true. In the clothes we wear, the food we eat, the books we read, and the ideas we hold, there is a strong tendency toward conformity, toward stereotypy. To be original or different is felt to be 'dangerous'.

.....Unless man can make new and original adaptations to his environment as rapidly as science can change the environment, our culture will perish. Not only individual maladjustment and group tensions, but international annihilation will be the price we pay for lack of creativity.

Consequently it would seem to me that investigations of the process of creativity, the conditions under which this process occurs, and the ways in which it may be facilitated, are of the utmost importance"

The present environment of the so called 'permissive society' in the Western World would appear to make this statement no longer valid. Unfortunately this is not true, as reflection, on points made by Rogers, reveals:

(i) There has been little basic change in the educational field; particularly at the secondary school level, where, in addition to 'O' and 'A' level examinations the 'CSE' and a wider range of examination subjects have increased pressures rather than decreased them.

(ii) The 'mass media' have tended to increase the passivity of groups and individuals in the field of leisure. People may become 'interested' in a wide range of leisure activities as a result of the mass media; they may watch them avidly on TV, or even become spectators as a result of such stimulation. They will read about these interests and collect books, magazines and articles.

It has yet to be shown however, that any significant number of individuals engage in 'creative' activities as a result of such 'mass media' stimulation. Admittedly many of the 'activities' shown on TV or featured in 'the glossies' demand financial resources much beyond the reach of the average individual; e.g. power-boat building and racing, motor racing, golf, wine collecting, antiques, or home decorating on the grand scale, where active participation is denied.

It is true that the space-race has improved the development of creativity in the areas of science and technology - war also tends to do this - though it is doubtful if this has spread to business, industrial, or professional fields.

(iii) It is possible that the tendency toward conformity in individual and family life is increasing, again possibly due to mass media pressures. Certainly, in the 'consumer orientated society' prevailing today, the concept of 'keeping up with the Jones's' appears to be strengthening rather than weakening, and not only in the so called 'civilized' societies of the 'first world'.

Advertising and Supermarket and Hypermarket selling techniques may account for much of the conformity of products bought (creativity is undoubtedly well to the fore in many of the marketing ploys involved here),

and indeed, for much of the similarity of the life and architecture of our city and town suburbs; or even their centres where new or re-development occurs.

The young are not immune from these pressures to conform. They are indeed the main target for much of the advertising pressure; they are made to feel that they must have the latest 'tranny' or 'cassette' the latest motor-cycle and leather gear, or they are not accepted by their chosen 'group'. Such pressures are not new of course, but they are becoming more universal and leading to wider conformity.

There may be some hope however, in the number of 'cult' groups of different types - religious, mystic, aesthetic, political, etc. that spring up in the youth of today. This may well be a protest against the increasing 'conformist' pressures and a degree of 'creativity' is often seen in such attempts to resist these pressures.

(iv) When regarded in the light of these points, Rogers' statements become even more important; particularly as it appears that the major increases in creative work are found in the fields of science and technology.

The scientist and technologist have made, and are achieving at an ever increasing rate and in new and diverse fields, considerable control over material aspects of our lives.

This is not the case where creative improvements to the social structures of mankind are concerned. We can put men on the moon, but we cannot prevent violence and dissent - at a football ground for example.

The need for creativity in the psychological and sociological fields of our environment is becoming urgent if we are to survive, let alone contain our expanding technological environment.

This is true at international levels also, but it is at the roots of man's social environment, particularly the young roots, that such creativity is needed.

Nearly a decade later than Rogers, Torrance (1967) pointed out "Only a few years ago, it was commonly thought that creative thinking, the production of new ideas, inventions, and the like, had to be left to chance. Indeed many people still think so! Yet I do not see how any well informed person can still hold this view. The amazing record of inventions,

scientific discoveries, and other creative achievements amassed through creative problem-solving methods, ... should convince even the most stubborn sceptics. Experiments involving these deliberate methods of improving creativity have also been rather convincing. ...In my own classes and seminars, I have consistently found that these deliberate methods can be taught from the primary grades through the graduate school with the effect that the students improve their ability to develop original and useful solutions to problems. In my opinion, the evidence is strong that creativity does not have to be left to chance."

Torrance (1967a) further stated, and even more strongly,

"It seems to me that we have reached a stage in history when we must make such a choice. In the past we have been able to survive with static goals and concepts. Things are changing so rapidly that we can no longer survive, if we insist on thinking and living in static terms. It seems to me that we cannot afford to return to the old ways. We must accept the creative challenge."

Other authorities in the field of creativity (Guildford 1967; Parnes 1967; Cropley 1967;) have also stressed the need for developing creative ability. Perhaps the strongest indictment of our attitude towards creativity came, over twenty years ago, from Grabe (1948) who said:

"Considering man's hostility to change and innovation ... it is astonishing that so much of creative imaginative genius has contrived to leave its impression on the human race. Yet who can doubt that more, habited in weak bodies, blasted early by ignorance and cruelty and superstition, has perished with no record? In our comparatively low civilization, a little is done, under favourable circumstances, to salvage great talent, to give it opportunity to grow and express itself. Yet how pitifully meagre is our salvage and how great the waste! We know that this is so, a more civilized time than ours will strive to develop this, the greatest of all natural resources."

This 'need' for developing creative ability, or at least an awareness of its importance for the ultimate survival of mankind reveals the problem area which is the concern of this study.

The problem is: "How can creative ability be increased?" The author's interest is in the field of visual creativity, particularly in secondary schools, though an interest in the overall field of creativity is inevitable of course.

It is felt that any development of creative ability in the individual may have an affect on creative activity in a number of fields. The basic concern, however, is to increase creativity in the visual field in secondary school education.

When considering possible methods for increasing creativity, it is advisable to take into account the charge that 'Man is hostile to change and innovation'. It is therefore appropriate to examine new and allegedly, more effective educational methods.

In this context the recently developed methods of Programmed Instruction spring to mind as an innovation that may lead to great changes in education.

It has been stated (Britannica Extension Service, 1968) :

"The impact of programmed instruction is being felt in many countries outside the United States and it has been acclaimed as the most significant development since printing in the communication of knowledge".

While this is rather an extravagant claim, or appears so at the present time, it arouses the desire to test the validity of such statements.

The resistance of educationists and teachers to the use of programmed instructional methods in schools has been reported by several researchers in the field. Stolurow (1964a) stated:

"While the possibility of their contribution to educational research seems clear and potentially significant, their acceptance and use in the classroom is another matter, since they seem to be unacceptable to many classroom teachers."

This state of affairs still appears to be the case; even though two years later Leith (1966) pointed out:

"In the last four years programmed learning has progressed from the status of a novelty to that of a methodology which could embrace every form of teaching and curriculum."

There is undoubtedly a strong case for using programmed instructional methods. However, their suitability for increasing creative ability, or indeed any ability other than the acquisition of factual knowledge, has been questioned by many educational authorities. Nevertheless, Stolurow (1964a) has predicted:

"Learning from auto-instructional programming will be shown to be capable of aiding persons to solve problems creatively."

He, at least, believes that creativity and programmed instruction are not incompatible.

A further attraction of programmed instruction is the fact that it is aimed at the individual. As Macdonald-Ross (1969) says:

"The trend is toward an educational system able to cater for individual needs, and in programmed learning we have a technique which can help towards this end."

It would appear that programmed instruction is a method that can be used in an attempt to increase creative ability of individuals, even though there may be difficulties with such an attempt.

From the brief survey of the claims for programmed instruction and the need for increasing creative ability in individuals, the problem becomes clearer. The problem can now be restated as follows:-

"Can programmed instruction be effective in increasing creative ability, particularly in the visual field?"

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## CHAPTER THREE

### REVIEW OF LITERATURE

#### TABLE OF CONTENTS

##### SECTION ONE: CREATIVITY

##### A: GENERAL THEORIES OF CREATIVITY AND CREATIVITY IN THE VISUAL ARTS

(1) DEFINING CREATIVITY	14
(11) CREATIVITY IN TERMS OF PERSON, PROCESS AND PRODUCT	16
(a) THE CREATIVE PERSON	16
(b) THE CREATIVE PROCESS	25
(c) THE CREATIVE PRODUCT	33
SUMMARY	39

##### B: THE IDENTIFICATION AND MEASUREMENT OF CREATIVE ABILITY

(1) TESTS BASED ON VISUAL ART JUDGEMENTS	41
(11) TESTS RELATING TO THE PERSONALITY OF THE CREATIVE INDIVIDUAL	43
(111) TESTS OF CREATIVITY	50
SUMMARY	61

##### C. METHODS FOR INCREASING CREATIVITY

1.) Influences on Environmental Factors	63
2.) Influences on Process Factors	75
SUMMARY	86

##### SECTION TWO: PROGRAMMED INSTRUCTION

##### PART A: Developing Concepts in Programmed Instruction

1. Self Pacing	89
2. Immediate Knowledge of Results	91
3. Active Overt Response	93
4. Small Steps	94
5. Appropriate Sequence of Subject Material	96
6. Evaluation	98
7. Other Developments	100

##### PART B: Using Programmed Instruction for Increasing Creativity

Programmed Instruction and the Visual Arts	107
Conclusions	107



## SECTION ONE: CREATIVITY

### A: GENERAL THEORIES OF CREATIVITY & CREATIVITY IN THE VISUAL ARTS.

#### (1) DEFINING CREATIVITY

Creativity is an amorphous word; much maligned and abused today, it has been defined in many ways.

Gardener (1962), concerning the status of 'creativity' at that time, stated "It is more than a word today, it is an incantation. It is a kind of psychic wonder drug, powerful and presumably painless; and everyone wants a prescription."

This attitude developed due to commercial and industrial pressures in the wake of the 'space race'; when it was apparent that knowledge alone did not lead to achievement, but that it was necessary to 'use' it creatively. The fact that 'creativity', though undoubtedly a vital factor, did not lead to the solution of all of the problems facing mankind 'in the twinkling of an eye' may account for the disillusionment that followed later.

It is important for the research worker to define 'creativity' as explicitly as possible. Our knowledge of creativity, in the three main areas of research - person, process, and product, is still imperfect. It is not easy therefore, to define the term as precisely as we would wish.

In the opening chapter the word 'creativity' was loosely defined as 'Original, Divergent Production'. This definition is concise, but a more detailed analysis is necessary to establish satisfactory criteria in the present research.

Some definitions of 'creativity' are examined under the following headings: Originality, Relevance and Evaluation, and Divergency.

#### ORIGINALITY

Koestler (1964) states "The measure of an artist's originality... is the extent to which his selective emphasis deviates from the conventional norm and establishes new standards of relevance". Fleigler (1959) says

that man "... manipulates external symbols or objects to produce an unusual original event uncommon to himself and/or his environment."

Kneller (1965) states that the highest kind of creativity "Shatters the mould of custom and extends possibilities of thought and perception."

Originality is thus seen as a major criterion.

#### RELEVANCE AND EVALUATION

Torrance (1962) says that creativity is a "...process of sensing gaps ..., forming ideas of hypotheses concerning them, testing these hypotheses and communicating the results, and possibly modifying and retesting the results." i.e. the 'creation' must 'fill the gap'; it must work.

Barron (1963) states "... if a response is to be called original ... it must be to some extent adaptive to reality."

MacKinnon (1967) postulates that 'creativity' must fulfil at least three conditions: "1. A novel response, 2. that is adaptive to reality, and 3. is elaborated; the idea is developed to the full.

These three definitions pinpoint the important factors concerning originality. The creation must be relevant, and evaluation must take place to prove that it is a relevant solution to the problem involved. The solution should be developed to the full; i.e. elaborated.

Other researchers, e.g. Burt (1962) are also concerned that creative work must be useful and deal rationally, as well as inventively, with problems.

#### DIVERGENCY

'Divergent' is a term that is often used in defining creativity. When it is used, however it is more appropriately used in connection with the 'creative person' than the 'creative product'. One can say that a product is 'original', but it seems wrong to refer to a 'divergent product'. Thus divergency is not quite the same as originality.

Cropley (1967) states "... some people mistakenly imagine that mere unconventionality is in itself creative, or that merely to do something different from most people around you is to be a divergent thinker."

The concept of 'divergent' and 'convergent' factors is thus more appropriate when considering creative persons or creative thinking processes.

From the few definitions considered above, it appears that there are three main areas of interest in examining the concept of creativity; the creative personality, the creative process, and the creative product. All three areas must be examined in order to discover satisfactory criteria for evaluating creativity; though it is true that in the final analysis the measure of a person's creativity is dependent upon his creative products.

Tyson (1966) states "For research, creativity is usually identified in terms of 'product'; but ... who is to judge which products are creative?"

Most people think that they can judge products in terms of creativity; when 'experts' disagree however, it is apparent that this is not always the case.

There has been little research, or even theorising apart from in the realm of the 'fine arts', concerning the criteria needed for judging the level of creativity displayed in a product.

A vast amount of research and consequent literature is available in the fields of 'the creative person' and the 'creative process'.

The three areas are now reviewed in an order that is normally found in the literature on creativity: i.e. Person, Process and Product.

## (ii) CREATIVITY IN TERMS OF PERSON, PROCESS, AND PRODUCT

### (a) THE CREATIVE PERSON

Drevdahl (1956) has stated "Creativity is the capacity of persons to produce compositions, products or ideas of any sort which are essentially new... It may take the form of an artistic, literary or scientific production, or may be of a procedural or a methodological nature."

Rogers (1962) states, in a similar way, "Creativity is not... restricted to some particular content. I am assuming that there is no fundamental difference in the creative process as it is evidenced in painting

a picture, composing a symphony, devising new instruments of killing, developing a scientific theory, discovering new procedures in human relationships, or creating new formings of one's own personality as in psycho-therapy."

Kneller (1965) says "All individuals are creative in diverse ways and to different degrees."

Concepts of a similar nature are provided by Bronowski (1956), Barron (1967), and Simon (1964). It therefore seems to be accepted that there is no fundamental difference in the personality of creative persons who function in different fields; though, for the purposes of this review, only the personality of the creative person who performs at a high level of creativity is considered in detail.

One of the major traits found in the creative personality is that of 'intelligence'; very few persons who are creative at the highest levels are also not intelligent at a high level.

The reader is no doubt familiar with the hypotheses and assumptions concerning intelligence and its measurement. The view taken by the author is that intelligence, as revealed by the 'intelligence test' only shows that which the test is designed to reveal, and that an intelligence test score does not reveal the whole picture of cognitive functioning, any more than any other type of test score does. Nevertheless some of the studies that have explored relationships between creativity and intelligence should be examined briefly.

The study of Getzels and Jackson (1962) is now well known. Though their main contention is that there is a low correlation between intelligence and creativity, and their findings tended to support this, their studies have been critized by a number of authorities (e.g. Burt: 1962) who make the point that very creative persons are also often very intelligent. Getzels and Jackson (1963) however, point out that "As might be expected, the creativity measures and I.Q. were not independent, the correlation between the two ranging from 0.12 to 0.39." Intelligence is probably an important factor in

the creative personality.

The more detailed study by Wallach and Kogan (1965) was done as a result of their critical approach to the Getzels & Jackson study. They were doubtful if there is "...an aspect of cognitive functioning which can be appropriately labelled 'creativity' that stands apart from the traditional concept of general intelligence." If such a distinction could be found, they were interested in the psychological correlates that distinguish differences between individuals.

They were also critical of the types of testing for creativity that were used by Getzels & Jackson. Wallach and Kogan devised tests for creativity that attempted to eliminate the 'time' factor and the testing of 'groups'. They designed their research so as to put the subjects 'at ease' before they started testing.

They analysed the data in various ways and found that there was a low correlation between the creativity measures and the intelligence tests. They stated "It is a considerable surprise that such a dimension should prove to be quite independent of general intelligence and it seems indeed appropriate to label this dimension 'creativity'."

Perhaps the most important findings made by Wallach and Kogan were those concerned with the four groups they examined: i.e. High Creativity and Intelligence, High Creativity and Low Intelligence, Low Creativity and High Intelligence, and Low Creativity and Intelligence. The psychological traits they found are mentioned in the next section, but the main difference between their study and that of Getzels and Jackson is that shown by their statement "These results make it clear that one needs to know whether creativity ... is present in the context of high or low intelligence, and one needs to know whether intelligence ... is present in conjunction with high or low creativity."

There have been a number of studies, similar to those of Getzels and Jackson, and Wallach and Kogan, dealing with the difference between

creativity and intelligence. The bitter conflicts that occurred in this area have largely died today. Most people tend to concur with Cropley (1966) when he states "... it is unacceptable to think of 'creativity' as a separate basic intellectual mode."

It is true, however, that if one relies only on I.Q. tests then many creative persons will not be detected. Torrance (1962) said "... if present methods of identifying talent had been applied they would have eliminated many of the great men of the past."

The author accepts the tenets held by MacKinnon (1962) when he states "... above a certain required minimum level of intelligence ...being more intelligent does not guarantee a corresponding increase in creativeness. It is just not true that the more intelligent person is necessarily the more creative one." and further "... if a person has a minimum of intelligence required for mastery of a field of knowledge, whether the person performs creatively or banally in that field will be crucially determined by non-intellectual factors."

Hudson (1966) has also found this in his studies of able schoolboys when he says "... the factors that determine an individual's creativeness are personal not intellectual."

The remainder of the review concerned with the creative person considers these non-intellectual factors.

There are two main approaches to the study of the creative person. The first may be termed Analytic, and the second Nomothetic. The Analytic Approach is based on the analysis 'in depth' of persons known to be creative. A great number of methods have been used for this analysis; life-history, Rorschach, TAT, and other psycho-analytic tests, experiments, questionnaires, self-reports, etc. The data from such studies are examined to determine which traits are common to the majority of creative persons.

The Nomothetic Approach is concerned with detecting traits that are common to creative persons, but in this case large numbers of the total

population are examined, using tests that attempt to 'measure' the various traits. The data gathered is then analysed in terms of various groups of the population, e.g. artists, architects, craftsmen, creative scientists, to ascertain which traits, and at which level, are common to creative persons. Many 'objective' tests have been devised, providing profiles of different types of personalities, by researchers using this approach.

The majority of tests developed for use in this approach have the advantage that they are intended for use with 'groups' of people, and are simply and quickly scored.

A great number of traits that are common to creative personalities have been found by these two main approaches to the study of the creative person. Many of the traits seem to be either the same trait under a different name, or are closely related. Because, of this, in the remainder of this section of the review on the creative person, the main traits found by the two different approaches are considered together.

The traits listed are under nine headings, which are adopted as being representative of groups of similar or related traits. The headings are: Adventurous, Contemplative, Individualistic, Questioning, Energetic, Humorous, Emotional, Versatile, and Persevering.

#### ADVENTUROUS

TRAITS: Open to Experience, Not Afraid to Take Risks, Progressive, Venturesome, Uninhibited, Undisciplined, Impulsive, Likes the New or Unusual, is Original, Thinks Boldly, is Spontaneous, and Experimenting.

#### RESEARCHERS:

*Arnold (1962a)	Guilford (1959:1960)	MacKinnon (1962:1967)
Cattell (1965)	Hallman (1967)	Maslow (1962)
Cropley (1967)	*Kneller (1965)	Sultan (1962)
*Drevdahl (1956)	*Koestler (1964)	Taylor & Holland (1962)
		*Torrance (1962:1966:1967b)

A remark typical of findings in this area is that made by Cropley (1967),  
"Highly creative thinkers were significantly more willing to take intellectual risks..."

\*\*\* indicates researchers who have stressed the trait of a liking for the new, unusual, or original.

#### CONTEMPLATIVE.

TRAITS: Imaginative, Inventive, Playing with Ideas, Introverted, Dreamer or Daydreamer, Sets Problems for Self, can Regress (in the service of the ego - use Unconscious Primary Processes), Ideas More Important than People, Internally Orientated, Speculative, Tolerates Disorder [ and Ambiguity), is Reserved, and Sober (Serious).

#### RESEARCHERS:

*Barron (1962: 1967)	*Hallman (1967)	Simon (1964)
Cattell (1963)	*Kneller (1965)	Stein (1967)
*Cropley (1967)	MacKinnon (1962)	Taylor & Holland (1962)
Drevdahl (1956)	Maslow (1962)	Torrance (1967b)
Guilford (1959)	Ray (1967)	*Wild (1965)

A remark made by Torrance (1967b) typifies the trait of contemplation in the creative individual, who "...may look like daydreaming when he's thinking..."

The concept of 'regression' is stressed by those researchers marked \*; in particular Barron (1967) who said that the creative person has the ability to "...regress yet return to a high degree of rationality and self-criticism ." Critics of this concept are represented by Ray (1967).

#### INDIVIDUALIST

TRAITS: Independent, Egoistic, Self-sufficient, Autonomous, Unconventional, Non-conformist, Prefers Own Ideas to Popularity, Rebellious, Anti-authoritarian, Self-centred, Self-assured, Self-disciplined, Does not Mind if Different from Others.

#### RESEARCHERS:

Barron (1967)	*Cross <u>et al</u> (1967)	*McGuire (1967)
*Cattell (1963)	Guilford (1967a)	*MacKinnon (1962:1967)
Cropley (1967)	Kneller (1965)	*Torrance (1967b)

Researchers marked \*\*\* have stressed the concepts of individuality and non-conformity; McGuire (1967) captures the essence of this group of traits



when he states "Findings... indicate that ... creatively intelligent independence, and a certain amount of self-discipline are essential elements of emotional learning, as well as being free to become a creative or talented individual."

#### QUESTIONING

TRAITS; Sensitive to Problems, Evaluative, Critical, Self-Critical, Perceptive, Complaining, Fault-finding, Argumentative, Disruptive, Sceptical, Forthright, Aware of New Phenomena, Prepares the Mind, Uses all the Senses, Not satisfied (with existing state of affairs), shows 'Lack of Closure', and Inquiringness.

#### RESEARCHERS:

*Arnold (1962a)	Gough (1962)	Simon (1964)
Barron (1967)	*Guilford (1960)	Stein (1967)
Cattell (1963)	MacKinnon (1962:1967)	*Torrance (1962:1967b)
*Drevdahl(1956)	Maslow (1962)	

Arnold's (1962a) remark concerning the creative person as "...fired with a spirit of enquiry..." is typical of findings in the area. Stein (1967) reveals a motivational aspect when he states "...there is a lack of closure, ...that the individual experiences a lack of satisfaction with the existing state of affairs."

Researchers marked '\*' have stressed the creative person's sensitivity to the problems'.

#### ENERGETIC

TRAITS: Industrious, Dynamic, Vital, Enthusiastic, has Unbounded Energy, Mental and Physical Drive.

#### RESEARCHERS:

Arnold (1962a)	Hallman (1967)	MacKinnon (1962)
Barron (1967)		

A typical description of the Dynamism of the creative person is that of Baron (1967) who found they had "...vigour, and an exceptional fund of Psychic and Physical Energy."

## HUMOROUS

TRAITS: Sees the 'Funny' side of things, has a Strong Sense of Humour.

### RESEARCHERS:

Guilford (1967a)

Kneller (1965)

\*Koestler (1964)

The work of Koestler is well known in this field, Kneller (1965) has given as one reason for the creative person's sense of the humorous, is that he "...sees more meanings in a situation than does the ordinary person, many of them subtle and unusual."

## EMOTIONAL

TRAITS: Sensitive, Empathic, Crazy, Tender-minded, Anxious, Tense, Neurotic, Moody, Aggressive, Rude, Dominant, Feminine, Aesthetically Sensitive, and more Primitive (and more Cultured)

### RESEARCHERS:

\*Barron (1967)

Gough (1962)

Stein (1967)

Cattell (1963)

\*MacKinnon (1962:1967)

Wallach & Kogan (1965)

Drevdahl (1956)

\*Maslow (1962)

Researchers who have stressed 'emotional' factors are indicated '\*'.

Maslow (1962) has commented on 'unpopular' traits found in young creatives, and finds that they are often "...undisciplined, ... called childish, irresponsible, wild, crazy, irregular, emotional."

Wallach & Kogan (1965) found that "Creativity is maximal in the presence of an intermediate level of anxiety."

## VERSATILE

TRAITS: Fluent, Divergent, Likes Variety, Flexible, Associative, 'Codes' Data (in a broad linked way), Integrative, Redefines, and Verbally Skilful.

### RESEARCHERS:

Arnold (1962a)

\*Drevdahl (1956)

Hudson (1966)

\*Barron (1962:1967)

\*Gough (1962)

\*Kneller (1965)

Bruner (1957)

\*Guilford (1959:1960)

\*Sultan (1962)

\*Cropley (1966:1967)

\*Hallman (1967)

Researchers indicated '\*' have stressed the importance of Fluency and Flexibility. Hallman (1967) and Cropley (1967) have also indicated the

importance of the ability to 'code' data in a linked way, and 'integrate'. Hudson (1966) has made a particular study of the 'diverger'; Cropley (1966) has stated "... it may be wrong to argue either that convergent and divergent thinking cannot be distinguished from each other factorially, or that they are completely independent." He tends to reinforce Hudson (1966) who stated, concerning the creative person, "The roots of his originality lie, ... not in his convergence or divergence, but in other aspects of his personality."

#### PERSEVERING

TRAITS: Committed, Involved, Determined, Orientated to the 'Future', Pre-occupied with the Problem, Goes 'beyond' Set Task, has a Sense of Destiny, and Elaborates.

#### RESEARCHERS:

*Drevdahl (1956)	*Hallman (1967)	*Simon (1964)
*Gough (1962)	*Hudson (1966)	*Stein (1967)
Guilford (1959:1960:1967a)	*MacKinnon (1967)	Torrance (1966:1967))

'\*' indicates those researchers who stressed the traits of perseverance allied with a 'sense of destiny' or 'orientation to the future'.

Guilford and Torrance have also indicated the importance of the creative person's ability to 'elaborate'.

The traits considered in the nine groups are, of course, only representative of many. Those mentioned are however thought the most important.

A number of studies of the creative person, usually linked with the creative process, in the area of the visual arts have been reported by various researchers. Among the most objective are those by Lowenfield (1947), Brittain (1956), Brittain & Beittel (1960), Burkart (1960: 1962), Hausman (1963) and Ehrenzweig (1967). Many of the traits considered under the nine headings have also been found by these researchers in the field of visual art, and some mention of their findings will be mentioned in the section on 'Product'.

In conclusion it is appropriate to sound a warning concerning the identification of the creative person.

Though a much clearer picture of the characteristics of the creative personality is now available, it does not follow that a person who has such characteristics is, of necessity, creative. As Guilford (1967a) has stated concerning the traits found in the creative personality "... no one of them is a dependable sign, nor would all of them collectively be sufficient." i.e. sufficient to positively identify a creative person.

#### (b) THE CREATIVE PROCESS

Much of what has been reviewed concerning the creative person is linked to the processes involved when he creates; for example the capability of the creative person to 'regress in the service of the ego', or to 'integrate' and 'code' data obviously plays a part in the concept of creative 'processes'.

To a great extent the study of the creative process must be subjective. There are two main approaches to this study; 'self-report', and 'Observation of the physical activity of the creative person'. In both types of studies theories can be formulated and tested. Many of the theories so developed concerning the creative process, have been validated to a certain extent. It would not be wise, however, to think that all the answers are known in this very controversial field.

It is assumed, for the purpose of this study, that, as has been noted earlier in the review, there is only one type of creative activity. i.e. there is not one process for creativity in the arts and a totally different one for creative work in the scientific field.

Wallas (1926) has provided the useful and well known model of the creative process that has been adopted as a 'framework' for many studies in this area. His 'four stages in the creative process (Preparation, Incubation, Illumination & Verification)' were based on some early ideas of Helmholtz.(1891)

The review of literature in the area of the creative process is divided into four sections that correspond with the four stages.

As Wallas (1926) points out however, "In the daily stream of thought

these four different stages constantly overlap each other as we explore different problems."

### PREPARATION

Little has been recorded that is primarily concerned with the preparation stage of the creative process. Wallas (1926) himself stated "I shall not deal at any length with the stage of preparation. It includes the whole process of intellectual education."

As this stage, though often dealt with summarily, is a vital one the remarks made by some researchers are considered.

In one sense, as indicated by Wallas, the development of the creative personality, from his earliest days, is 'preparation' for the act of creation. Inherited and environmental factors are concerned in this complex and normally unpredictable development. The review of this preparatory stage however, is confined to those factors considered directly relevant to preparation for the creative act.

Ghiselin (1952) states "A great deal of the work necessary to equip and activate the mind for the spontaneous part of invention must be done consciously and with an effort of will. Mastering accumulated knowledge, gathering new facts, observing, exploring, experimenting, developing technique and skill, sensibility, and discrimination, are all more or less conscious and voluntary activities. The sheer labour of preparing technically for creative work, consciously acquiring the requisite knowledge of a medium and skill in its use, is extensive and arduous enough to repel many from achievement."

Other researchers have referred to preparation in their interpretations of the creative process. Guilford (1967b) mentions Dewey (1933) who postulated "Recognition of the Problem, and Analysis of the Problem." and Rossman (1931) who suggested "Observation of a need or difficulty, analysis of the need, and survey of all the available information." These suggestions are obviously

concerned with the preparation stage, and also indicate that the person has the ability to 'sense problems', which is one of the characteristics of the creative person.

Guilford has also considered the collection and retrieval of information in terms of 'transfer'. He states "Novel thinking means that the retrieved information is to be used in new forms or new connections, and this means transfer learning..." This implies that information gathered in other fields may be used in solving problems in the field for which special preparation is undertaken. Simon (1964) reinforces this view when he states "If you expose yourself to a variety of disciplines or areas of knowledge, you may be able to put together the ideas you get from these different fields in novel combinations and solve problems that others haven't."

Mednick & Mednick (1964) have used similar concepts in their 'associative theory', and conclude "The more mutually remote the elements of the combination, the more creative is the process of solution."

This concept of gathering together ideas from the knowledge gained in a number of different fields shows that conscious preparation is not an easy task. The importance of 'finding the problem' is seen as a major factor in creative work. Osborn (1962) has quoted Einstein who thought that "The formulation of the problem is far more often essential than its solution." Though perhaps a little sweeping, there is insight in this statement.

Accidental discoveries are often mentioned, the creative person must be so prepared that he is able to recognize the implications of such 'accidents'. The knowledge of "potentially over-lapping fields of .. exploration." as Barlett (1958) puts it, is also likely to assist in recognition of such 'serendipity'; indeed it is often the acquisition of such 'overlapping knowledge that leads to the awareness of a problem.

Few authorities refer to actual techniques for gathering information; those mentioned by Kneller (1965) 'reads, notes, discusses, etc.' are as detailed as some, and more than most.

Some more obvious methods involved in conscious preparation, implied

rather than stated in the literature, can be summarised as follows:

1. Sensory Collection: Using all the senses, as fully as possible to gather data.
2. Experimentation: Experimentating with ideas, language, materials, tools, equipment, media, etc.
3. Skill Development: Developing skills to a high degree of competency, manual and/or mental, particularly where they may be relevant to particular fields of interest.
4. Research (General) : Studying - nature, books, films, artifacts in museums, galleries, industry, commerce, laboratories, etc.
5. Research (Particular) : Studying as above but in the particular field of interest, especially with regard to past achievements of creative persons, to avoid repetition and to build on the work of the past.

An extremely important part of this preparation is the:

Recording of Information and Ideas: This can be - memorised, noted, taped, filmed, sketched, etc., in such a way that it is easily retrieved.

Preparation of this type is essential to attain 'Mastery of the Subject' and 'Mastery of the Media'.

### INCUBATION

This stage in the creative process is, of necessity, little understood. Creative Thinking cannot be observed in the normal way. Numerous hypotheses, models, theories, etc. have been devised and tested in various ways. There is much controversy in this area.

Psycho-analytic theories and S-R theories are at the opposite poles of the 'incubation continuum'. As an example of the analytic theory Kneller (1965) states "After the conscious mind has done its work, the unconscious, as psychoanalysis has shown, takes over. The period of conscious preparation is followed by a time of non-conscious activity in which the creator's ideas go 'underground'. There the free-ranging unconscious, untrammelled by the literal intellect, makes those unexpected connections that are the essence of creation."

S-R theorists are normally very critical of this type of theory. Such criticisms are well expressed by Guilford (1967) who states. "This is a charming but futile substitute for an explanation." Few alternative explanations for 'creative thinking' are offered by S-R theorists, however.

Thus, in order to try to increase creative thinking ability, some adaptation, etc. of 'unconscious thinking' theories, models, or hypotheses is probably useful in this area.

The major theory that has led to the development of methods for increasing creativity is that of 'regression'. This concept is well expressed by Schiller, quoted by Freud (1938), when he states "In the case of the creative mind ... the intellect has withdrawn its watchers from the gates, and the ideas rush in pell mell, and only then does it review and inspect the multitude."

In psychoanalytic terms the 'watcher', or 'censor' as it more often termed, is negated and the unconscious thought processes allowed to run riot in activities of retrieval, association, combination, etc. As Prince (1968) states the "...unconscious or subconscious is ... a storehouse of immense capacity. According to Freud, it contains everything one has experienced since conception. "Prince also considers that the 'censor', very early in life, controls, and thus in a way undermines the creative potential.

The kernel of the idea of 'regression' is that the creative mind can ignore the 'censor' and tap the 'storehouse' of knowledge and experience in an 'unconscious' incubatory process.

The basic tenet of regression in the incubatory stage can provide a useful model on which to base conscious creative activity, as will be seen later. The importance of the unconscious, or 'irrational' is pointed out by Barron (1967) who stated "... I believe the creative individual not only respects the irrational in himself, but courts it as the most promising source of novelty in his own thoughts."



Although it is never stated, the impression is given that 'logical' processes are not used in creative production. It often appears that 'incubation' is synonymous with 'regression' and its associated 'unconscious' processes. This is manifestly oversimplification of the process; and certainly 'thinking logically', 'convergently', or 'conventionally' does play a part somewhere in the creative act; even if it only occurs when ideas reach the 'conscious' stage.

Terms that have been used when discussing the creative process are: Daydreaming, Doodling, Combination, Building, Boundary Pushing, Serendipity, Trial and Error, Use of Paradox, Concentrated Effort, Synthesis, and Association. Some of these terms obviously refer to processes that are 'hidden', e.g. Daydreaming, Serendipity; and some to 'observable' processes, e.g. Doodling, Trial and Error. Most terms only describe one particular activity in the creative process, e.g. Combination, building, and rarely attempt to describe exactly by what method the creative individual arrives at a solution using these activities.

Further consideration will be given to creative thinking processes in the section on 'methods for increasing creativity', where deliberate methods for stimulating, or eliciting conscious creative thinking processes are discussed.

### ILLUMINATION

The illuminatory stage of the creative process is simply stated, accepted by the majority of researchers in the field, but perhaps not quite as easily explained. For the purpose of the review it is accepted as a viable, practical concept; non-controllable, but also not important from the experimental standpoint.

Illumination is usually interpreted as the 'sudden flash' when the solution to a problem occurs.

Youtz (1962) states "New solutions usually appear whole." Hallman (1967) found "Surprise. The shock of recognition which registers the novel experience: creative artists and scientists have observed this in themselves.

Recognition is sudden and unexpected. Poincare (1952;Ed Chiselin) says

"One day, going along the street, the solution of the difficulty which had stopped me suddenly appeared to me" and further "Most striking at first is this appearance of sudden illumination."

Numerous researchers have found this 'illumination' to be a part of the creative process;a'sudden' appearance in the mind of the solution is a common occurrence also reported by many artists, writers, scientists, in fact the majority of creative persons.

From the 'sudden appearance' of the solution in terms of the 'idea' the process moves into the conscious stage. The idea has to be developed, elaborated, constructed, etc., in such a way that it is a recognizable product.

This stage of conscious, activity is rarely mentioned; presumably because it is so obviously necessary, and the process, at this point, depends upon what media, method, etc. the creative person is using.

It is during, and on completion of, the 'act' of creation that the creative product must be tested.

#### VERIFICATION

The fourth, and final stage in Wallas's concept of the creative process, may be simply defined as 'seeing if an idea works'. Taylor (1967) proposes as the fourth stage "Deliberate Effort, Verify, Elaborate, Revise."

As noted previously, between the 'sudden flash' of illumination and the actual testing of an idea, there must come a stage of conscious development. Taylor implies this and that, following initial testing must come a revision stage. This evaluation and revision is vital, and often leads to further creative thinking in order to improve the creative product.

Rossman (1931) proposed seven stages in his concept of the creative process. The last three stages following the 'solution' being:"5. Critical analysis of the solution, 6. The birth of the new invention. 7.Experimentation to test out the idea." Here again is the realisation that the idea or

solution which comes suddenly does not often come complete and perfect. Testing and revision are essential.

One of the traits found by a few investigators to be a characteristic of some creative persons is that he 'cannot be bothered with details'. The 'evaluation' stage, for such a person, hinders the flow of new ideas. This may be true although Guilford (1967)) thinks "...it is more detrimental to the appearance of low-quality ideas than it is to the appearance of high-quality ideas. "Guilford also believes that 'evaluation' takes place through out the creative process. It must be remembered, of course that Wallas also said that the four stages "constantly overlap".

The actual process of verification or 'evaluation', as it is more often termed today, though of necessity a conscious act, is just as controversial a stage in the area of creativity as the incubatory stage. Moore (1962) says "The fun of creativity is replaced by the work of difficult decision making."

One difficulty, not often stressed but noted many times, is the question of 'time' and its involvement in the evaluation of a creative product. Ghiselin (1952) stated "Neither in art nor in science is the use always anticipated. Application of a scientific truth to narrowly practical purposes may never occur, and it often follows long after the discovery." Thus the true value of any creative idea, product etc. may not be realised in the creators own lifetime. All fields of creativity show examples of this fact.

The creative person himself must have faith in his creations even in the face of such a difficulty. Rogers (1954) puts this in context when he states "Perhaps the most fundamental condition of creativity is that the source or locus of evaluative judgement is internal. The value of his product is, for the creative person, established not by the praise or criticism of others, but by himself."

Thus it can be seen that the stage of 'verification' is fraught with difficulties in the area of creative products: which perhaps is the reason

that so little has been done on developing satisfactory criteria for Judging them.

### (c) THE CREATIVE PRODUCT.

To a certain extent, everything that does not exist in its natural state has been 'created' by man. The influence on the landscape, a microscopic ball bearing, the influential philosophies, religions, political ideas, Works of art, etc. are all 'creations'.

Evaluating any product created by mankind is difficult, and the products with which this study is concerned are no exception.

The main concern, therefore, must be to establish criteria concerned with judging creativity, and the particular level of creativity, in any product.

Brogden and Sprecher (1964) have stated "Despite the fact that products lie at the heart of criterion problems, little work has been done with them". The difficulties concerning such criteria are considerable; nevertheless some attempt must be made if objective studies are to be attempted.

The judgement of 'art works' is probably that area where the most work has been done on the criterion problem. Even so Thomas (1964) said "...there is need for work on identifying the nature of criteria on which judges base their judgement of aesthetic quality.", and this was stated concerning an area of creativity where the judgement of the product can be said to have reached a high level of acceptance. The early 'studies' in creativity were concerned with the field of the 'fine arts'.

#### Early Studies

Some attempts to establish objective criteria were made by such researchers as Valentine (1919); these were concerned with 'aesthetic' judgement in terms such as 'beauty', 'pleasure', etc. terms which may be rather 'woolly' by today's standards. His studies were concerned with the more objective

factors; such as 'uncommonness', (originality), and the preference for 'asymmetry' in the visual field. He also considered an emotional content important.

Spearman (1930) was also concerned with art judgement. He proposed five criteria for judging pictorial art:

"1. Truth, 2. Beauty (conservation of energy, balance, repetition, relation, variety, conation), 3. Emotionality, 4. Exaggeration, and 5. Self-Expression." Though it is not easy to pick out the more objective components in such criteria, undoubtedly such factors as 'conservation' are tied up with concepts of economy, and 'balance, repetition, relation, and variety' related to the more recent concepts of symmetry, rhythm, integration, and flexibility.

Emotionality is perhaps more bound up with the personality expressed in a product; this is only seen at the highest levels of creative activity. Associated with this is the concept that some great creations are 'larger than life' or 'exaggerated'. This is somewhat undefinable however.

More recent researchers in this field have attempted more objective criteria. Lowenfield (1947), and Arnheim (1954) have mentioned the importance of a factor of 'integration'. This, to an extent, appears to be related to the concepts of the 'Gestalt' psychologists such as Köhler (1924), whose definition of a 'Gestalt' was "... that the characteristic properties and effects cannot be put together out of the properties and effects of a like sort of its so-called parts."

Lowenfield and Arnheim mention many of the well known concepts for 'aesthetic' judgements; i.e. balance, shape, form, growth, light, colour, movement, tension, rhythm, dynamics, and tension. Some of these criteria are easily understood, and some only understood by those involved deeply in particular 'visual' areas. Some degree of objectivity can be applied concerning some of these criteria, but it is uncertain whether they apply to 'creativity'. There is some evidence, found by such researchers as MacKinnon (1962) and Barron (1967) that a preference for complexity,

asymmetry, and dynamism is a characteristic of creative persons.

### More Objective Approaches

More recent studies in the field of criteria for judging visual products have been developed by such researchers as Brittain and Beittel (1960), Burkhart (1962) and Beittel (1963). The concepts they have developed are based on the well known aesthetic criteria but are designed to 'measure' in some degree the level of creativity displayed.

Brittain & Beittel (1960) used an 'overall' (Gestalt) type of judgement but also detected the following factors in those works they rated as high-level; Complex, Asymmetric, Organised, Use of material in unusual ways, Full utilization of space, and Penetration of forms.

Less objective characteristics were also noted. e.g. high creatives displayed Spontaneity, Tension, Mood, and revealed Personality. The work of the high creative was not 'portrayal' but an attempt to capture the 'essence' of the subject of their work; akin, perhaps to Plato's concept of the essential 'form' of things.

Beittel (1963) used objective criteria, based on bi-polar semantic scales (similar to those used by Osgood: 1957), in a study of criteria, art objects and judges. Though primarily concerned with characteristics of the judges, the twelve scales are of interest in that numbers 1 to 5, 7 & 8 may be recognizable when judging most types of product. The scales are:

1. Good - Bad	2. Interesting - Boring	3. Sophisticated - Naive.
4. Full - Empty	5. Vibrant - Still	6. Mature - Youthful
7. Serious - Humorous	8. Complex - Simple	9. Intuitive - Rational
10. Informal - Formal	11. Accidental - Controlled	12. Feminine - Masculine.

Such a scale as Feminine - Masculine may be difficult to observe or relate to a 'product', but such concepts as Full - Empty, or Vibrant - Still, are immediately recognizable in products.

The work of Burkhart (1960;1962) is primarily concerned with the concept of Spontaneity, as opposed to Deliberateness, in art work .

He has defined Spontaneous and Deliberate work as follows:

"Spontaneous; Freedom in movement in materials and forms, speed, variety, decisive, sensitive, and bold. Deliberate; Stiffness in material and treatment, rigidity (not used negatively here), and deliberate in the 'classical sense'."

His basic findings were that creative persons produced more spontaneous work.

Burkhart has developed objective criteria for scoring art works based on the Spontaneous/Deliberate concept. These will be considered in Part B of the review concerned with the 'Measurement of Creativity'.

Mosteller (1964) devised a measure of 'art ability' comprised of the following judgements:

Aesthetic	-	overall quality and total excellence
Colour	-	original and sensitive
Composition-		organization, utilization, and interaction in 2-D space
Symbolism	-	representation of subject
Vitality	-	strength and movement
Perspective-		depth representation

These criteria are, in the main, concerned more with 'aesthetics' than with 'creativity' itself, though some concepts are related to factors found in creative production, e.g. organization, and vitality.

Eisner (1965), in a study of children's creativity in art, found four types of creativity:

Boundary pushing	-	extending limits
Inventing	-	using the known to create a new object
Boundary breaking	-	rejecting accepted assumptions
Aesthetic organizing-		conferring order and unity

These criteria are basically process orientated, though it is possible that recognition of these factors may be discernable in some products.

Eisner felt that the 'integration' of all the factors in the final product was important. He considered that this unity could be complex, asymmetrical, and even seemingly disorganized, but a coherence and harmony could be seen.

Two important factors in judging creative products, which are not easy to discern in strictly objective terms, are those felt to be main criteria

when defining creativity, i.e. 'relevance' and 'originality'. These have been mentioned previously, but some further points may clarify the issue.

### Relevance

A product must be 'relevant'; Kneller (1965) states "in sum an act or idea is creative not only because it is novel but because it achieves something that is appropriate to a given situation."

The 'appropriateness' of a product may be easily seen in some products, ideas, etc. e.g. a chair or method of transport, but may be much more difficult to judge in others, e.g. a painting, poem, piece of music, mathematical theory, or philosophical concept. Often such latter productions may not be considered relevant at the time they are created; the French mathematician Galois produced work that was not understood for about twenty five years.

A respect for the particular field involved is necessary to developing criteria for evaluating 'relevance' in a product. 'Experts' in particular fields may be useful here; though time has shown that 'experts' are often fallible.

### Originality

The concept of 'originality' has been reviewed in the definition of creativity. This is now a major criterion and fairly well understood; at least most persons would assume that they could recognise something as 'original'. When objective methods of evaluating 'originality' in a particular product are attempted however, it is not found to be so simple.

The great innovations are generally recognizable 'at some point in time'. As was noted previously, great works of art, scientific discoveries, etc., are 'obvious' to the majority, but rarely at the time they are created. "The distinction cannot be made by examining the product. The very essence of creativity is its novelty, and hence we have no standard by which to judge it. Indeed history points up the fact that the more original the product, and the more far reaching its implications, the more likely it is to be



judged by contemporaries as evil. The genuinely significant creation, whether an idea, or a work of art, or a scientific discovery, is most likely to be seen at first as erroneous, bad, or foolish. Later it may be seen as obvious, something self-evident to all. Only still later does it receive its final evaluation as a creative contribution." (Rogers 1954). Rogers statement may be considered valid in the light of historical knowledge, but it is perhaps more appropriate to great innovations. It is still necessary to attempt to evaluate creativity displayed in products that have a lesser impact on society, but which still involve a large measure of 'originality'.

Much creative work is concerned with 'improving' products rather than with innovation at its highest level. The level of creativity displayed in such improvements, in terms of originality, can still be appreciated. Measures of the degree of originality must therefore range from simple 'improvements' to the far reaching innovations.

While it may not be possible to judge the creative product at the highest level until some time in the future, it is probable that as evaluation of originality approaches the lower levels of creativity the 'time differential' nears the moment of creation.

The final judgement of the creativity of a product must rest on its capacity to 'change the way of life'; or at least 'add to the way of life' of the society in which it is created. As the majority of products do this in varying degrees, it should be possible to judge to some extent the degree to which it will 'change the way of life' in the case of products which are felt to be creative at the time of their production.

## SUMMARY:

A brief note of those factors that were found relevant in the areas of Person, Process, and Product forms this summary.

## PERSON:

The creative person, in terms of the nine groups of traits reviewed, is likely to be: Adventurous, Contemplative, Individualistic, Questioning, Energetic, Humorous, Emotional, Versatile, Persevering, and needs to have a certain minimum level of intelligence.

## PROCESS:

The creative process, terms of the 'four stages' proposed by Wallas, can be summarised as follows:

Preparation: involving - Sensing problems, Sensory collection, Experimentation, Skill development, Research (many fields), Research (particular fields), and Recording of knowledge gained.

## PRODUCT:

Some criteria, that may be relevant to judging products as creative or not, are that creative products should be: Relevant, Original, Dynamic, Complex, Integrated, Show Personality, Change way of life, or Add to way of life. show Mastery of Media, and Mastery of Subject area; and in visual art works - Asymmetry, Spontaneity, and Utilization of Space.

## B: THE IDENTIFICATION AND MEASUREMENT OF CREATIVE ABILITY

The need for valid and reliable instruments for the identification and measurement of creative ability has increased as research in creativity has intensified. As attempts to 'increase' creative ability are dependent upon such measuring instruments to indicate the degree of success achieved, a number of methods and tests for measuring creativity have been devised.

Taylor & Holland (1964) have stated "... the investigations of creative promise emphasize the assessment of a broad range of variables. These variables have included the following kinds of characteristics; intellectual, ... motivational, biographical, sociometric, and personality."

It can be seen that the areas, in which identification and measurement are attempted, are varied and wide; and that the task is not easy.

### Early Attempts

Torrance (1964) reviewed some of the early attempts to measure 'creativity' from the beginning of the 20th Century. A few of the early researches he mentioned are noted here.

Kirkpatrick (1900) used an 'inkblot' test. This 'inkblot' concept was found frequently in early testing, in creativity and psychological testing in general, and reached its final form in the 'Rorschach Test' - to be reviewed later. Other investigators who used the 'inkblot' approach were Boraas (1922), Abramson (1927) and Hargreaves (1927).

Tests for originality, fluency, and flexibility - which are often the main factors involved in creativity tests today - were evolved in those early days. Chassell (1916) devised a battery of twelve tests for originality. Among these was a test of 'completion'.

Tests involving 'completion', verbal or figural, are common today. Other researchers who devised tests of completion were Hargreaves (1927) and Franck (1958). Hargreaves also scored for originality and fluency.

Simpson (1922) scored for originality, fluency, and flexibility; he

also devised a test based on the use of fifty sets of four dots as a stimulus to figural creativity; i.e. the subject linked the dots as part of a creative work. This type of test has been recently developed further by Torrance and his associates, who have used circles or sets of parallel lines as stimuli in a similar way.

Numerous other tests have been devised, though mainly in the verbal field, by such early researchers as Colvin (1902). McCarty (1924), Andrews (1930), Grippen (1933), Markey (1935), Harms (1939), Vernon (1948), and Stephenson (1949).

Since these earlier attempts to measure 'creativity', more recent measuring instruments have been developed. There appear to have been three main approaches to testing for creativity. The remainder of this section of the review is divided into three sub-sections concerned with the three approaches:

(i) Tests based on 'visual art' judgements, (ii) Tests relating to the 'personality' of the creative individual, and (iii) Tests of 'creativity' itself.

#### (i) TESTS BASED ON VISUAL ART JUDGEMENTS

Basically, the tests based on visual art judgements are more concerned with 'aesthetics' than with creativity itself. They are of interest in the present study, as some of the later developments have been used in some researches in 'creativity'.

The majority of such 'visual art' tests present the subject with a choice of at least two 'pictures' (representational or abstract). The pictures may appear similar or be totally different, according to the type of test, but one of the presentations will feature characteristics such as asymmetry, rhythm and utilisation of space, that are preferred by creative persons.

The Meier Art Judgement Test (1940-42), consisting of works of art and designs for pottery, is a test of this nature. It has been used in studies of 'creativity' in the arts, and some degree of correlation with creativity

has been found by Kinter (1933), Morrow (1938), and Barron (1955). Basically however, it was designed as a test of aesthetic appreciation.

The Graves Design Judgement Tests (1948) is similar to the Meier Test but the test items are all abstract designs incorporating the principles of unity, dominance, variety, balance, continuity, asymmetry, proportion, and rhythm. The reason for the choice of abstract design was, as Anastasi (1966) mentions, "Non-representational figures were chosen in order to evoke a purely aesthetic response, unencumbered by associations with specific objects." As in the case of the Meier test, the Graves Design Test is mainly a test of aesthetics.

A number of 'art' tests are actually 'work samples' scored in accordance with principles of the type mentioned above.

Early tests of this type were the Lewerenz Tests of Fundamental abilities of Visual Art (1927), and the Knauber Art Ability Tests (1935). Anastasi (1966) states "In general, however, they appear to be crude when judged in terms of present day test construction standards." Anastasi makes a similar criticism of the Horn Art Aptitude Inventory (1951) with regard to the scoring, which she considers "Leaves much to subjective judgement,...". The Horn Inventory items, however, are similar to more recent tests in the figural field, in that they include simple figures, e.g. rectangles, as a 'springboard' for the imagination.

More recent tests in the 'aesthetic' area, based on 'preference' in a similar way to the Meier and Graves tests, are the Keiselbach Test of Aesthetic Discrimination (1956), which was used by Brittain and Beittel (1961); and the Barron-Welsh Art Scale (1952), a part of the Welsh Figure Preference Test.

The Barron-Welsh Art Scale has been used in a number of studies. The test consists of a set of sixty-two abstract line drawings which range from the simple and symmetrical to the complex and asymmetrical. The test was standardized in a study involving eighty painters who showed a preference for

the complex, asymmetrical, vital and dynamic figures. Non-artists preferred the simpler drawings.

Studies, using the Barron-Welsh Art Scale, have been made by Rosen (1955) Barron (1967), MacKinnon (1962: 1970) and Brown (1964). Their findings have supported the original studies.

Though there is some correlation between the tests of 'visual art' judgements and 'creative personality', they are not fundamentally concerned with 'creativity' itself; though Rosen (1955) did find that there was a correlation between the Barron-Welsh Art Scale and 'originality' ratings of students' art products...

#### (ii) TESTS RELATING TO THE PERSONALITY OF CREATIVE INDIVIDUALS

The Barron-Welsh Art Scale, mentioned above, has been used in recent times to detect the creative personality in the 'art field'. Early tests of personality were concerned with 'total' personality, and were often based on studies of the 'disturbed personality'. A number of approaches to the identification of the creative individual were considered earlier in the review, and some of the tests devised in this area were mentioned there.

This section of the review notes the development of some of the tests of personality that have been used at some time or other in attempts to detect 'creative persons'; though the instrument may not have been primarily designed for that purpose.

The tests are considered here in two groups, 'projective tests', and 'paper and pencil tests'. The projective tests are based on an individual's response to an obscure stimulus provided; the responses being 'analysed' in a variety of ways. 'Paper and pencil tests are more specific. Subjects make their responses to questionnaires, inventories/check lists etc, these responses are compared with 'profiles' obtained, using the same instrument, from populations e.g. sportsmen, psychotics, scientists, artists, high academic achievers, or extraverts; similar profiles indicate a possibility

that an individual may perform well in the field indicated.

The field of 'creativity' has been investigated using a number of such tests to determine the personality of the creative individual.

#### PROJECTIVE TESTS

Of the wide variety of projective techniques and tests that have been developed only two have been used to any great extent in the study of the creative person; these are the Rorschach Inkblot Test and the Thematic Apperception Test. Both are so well known that only a summary of the findings reported in a few of the studies are reviewed here.

##### The Rorschach Inkblot Test

Roe (1946) used the Rorschach Test in her study of American painters. She found that half of the artists involved in this study were lacking in 'perceptual facility' and 'creative imagination'. As the term 'artists' can include painters who are purely representational 'craftsmen', this is perhaps not surprising; especially in view of the very subjective nature of interpretations based on the Rorschach technique.

Roe (1952), in a later study of different types of scientists, found that "...social scientists show themselves to be enormously productive and intensely concerned with human beings; the biologists are deeply concerned with form, and rely strongly on a non-emotional approach to problems; the physicists show a good deal of free anxiety and concern with space and inanimate motion." Whilst the concept of 'scientific creativity' was not a major concern at this time, the findings do bear some relationship to creative studies in this field.

Barron (1955) used the Rorschach as one of his measures of originality; and although he did criticise its validity - he stated "The inkblot tests alone appear to bear little relationship to the other measures; indeed they do not even correlate significantly with each other." - he retained the test as "On the face of it, uncommon responses are original acts within the

definition of originality..."

In a later study, Barron (1962) found that creatives were tolerant of disorder and confusion. With the Rorschach in particular he found "...

original subjects insist to a most uncommon degree upon giving an interpretation of the blot which takes account of all details in one comprehensive, synthesizing image."

Rickers-Ovsiankina (1960) states "Popularity-Originality represents the opposite poles of frequency of a certain blot area with a certain content." The 'originality' factor appears to be the most important in studies using the Rorschach.

Weisburg and Springer (1964:1946) used the Rorschach in a study of highly creative children and reported "...they showed a tendency toward unconventional responses, unreal percepts, and fanciful and imaginative treatment of the blots."

The Rorschach Test is essentially a test that has to be administered individually.

#### Thematic Apperception Test (TAT)

Roe(1952) also used the TAT in her study of scientists; and, while to a certain extent her findings were similar to the Rorschach, her main conclusion was that the TAT rarely indicated the "... the drive for achievement that all of these subjects have actually shown in their lives".

Barron (1955) used the TAT to provide an 'originality' score. He adopted a nine point scale, and found that inter-rater agreement was .70 - a higher relationship than found using the Rorschach - and the TAT was one of the two tests, out of eight measures used, that correlated with a 'rated originality' score.

Projective tests, like the Rorschach and TAT, were not used in the measurement of creativity to any great extent in experimental research in the field, The length of time needed per individual, and the scoring difficulties inherent preclude such use, & many investigators are not convinced of their validity.



## 'PAPER AND PENCIL' TESTS

'Paper and pencil' tests, as they are often termed, are those where the subject makes a 'forced' response. This usually take the form of a question or statement where the subject is forced to make a choice among several answers, or choose a 'degree' of acceptance or non-acceptance of the statement. The answers to the individual questions themselves are not normally revealing; it is the 'way' in which the different types of subjects build up a 'profile' when responding to a large number of such questions or statements that is the vital factor.

Tests that come within this category include 'self-report inventories', 'check lists', 'interest blanks' or 'differential scales'. They range from tests intended to identify one factor e.g. a subject's 'interest' in the Rothwell-Miller Interest Blank, to tests that attempt to identify many factors in a subject's personality, e.g. the Minnesota Multiphasic Personality Inventory.

The Strong Vocational Interest Blank (developed in the early 20's and continuously revised) has been used in several studies of the creative person. The test consists of 400 items grouped in eight sections.

MacKinnon (1970) used this test in his study of architects, and found that the more creative architects scored higher on 'femininity'.

Barron (1955) used one of the VIB scales in testing the hypothesis that "... original persons reject suppression as a mechanism for the control of impulse." He found that 'originals' scored lower on this scale than 'unoriginals', thus tending to confirm his hypothesis.

MacKinnon (1970) has also used the Gough Adjective Check List (1952) in which a list of adjectives is checked by 'raters', and those most frequently checked are indicative of the characteristics of the subject. MacKinnon found that many of the adjectives indicated similar characteristics to those found by other methods (reviewed in the section on the 'creative person'). The adjectives found representative of the architects

are illustrative of the types of adjectives in the Gough Check list:

e.g. alert, artistic, intelligent, responsible, co-operative, ambitious, capable, civilized, dependable, friendly, pleasant, resourceful, active, confident, industrious, reliable, conscientious, imaginative, reasonable, adaptable, assertive, independent, determined, energetic, persevering, sincere, individualistic, and serious.

This list is representative of the types of adjectives, though in this case the unfavourable words are missing. As MacKinnon says, concerning the architects, "The impression which they make is obviously a highly favourable one." The same may not be true of other types of creative person.

The Study of Values (Allport-Vernon-Lindzey: 1960), based on the Types of Men (Spranger;1928), was designed to measure six interests, motives or attitudes: Theoretical, Economic, Aesthetic, Social, Political, and Religious. Forced response scores are obtained and profiles derived from them. Anastasi (1966) gives examples of test items and a profile of this test.

MacKinnon (1970) found that architects scored higher on the Aesthetic and Theoretical factors when he used this instrument.

MacKinnon used a similar measure, the Myers-Briggs Type Indicator (1958) based on Jungian concepts. This instrument yields scores on Introversion/ Extraversion, Feeling/Thinking, Judging/Perceiving, and Intuition/Sensation. MacKinnon found that creative architects were more Intuitive, Introvert, tended towards Feeling and preferred Perceiving. He stated "The majority of our creative writers, mathematicians, and architects are perceptive types." and further "The final preference in Jungian typology is the well known one between introversion and extraversion. It is clear that architects as measured by this test favour introversion."

Among the more complex of the 'paper-and-pencil', or self-report inventories, are the Minnesota Multiphasic Personality Inventory (MMPI), the California Psychological Inventory (CPI), the Sixteen Personality Factor Questionnaire (16PF) and it's equivalent High School Personality Questionnaire (HSPQ) and Children's Personality Questionnaire (CPQ). These well known tests have been used in a great many studies for a variety of purposes, including the study of creative persons.

Scales for numbers of factors (first and second order) have been derived - e.g.Introversion/Extraversion, Dependency, Dominance - and profiles are

available for numerous populations - normal, psychotic delinquent etc. for all these tests.

The tests are so well known that only a review of a selection of studies involving them in creativity is necessary here.

#### The MMPI and CPI

Barron (1955:1965) has used both these instruments in a variety of studies of creative personalities. A major finding was that "The creative groups consistently emerge as having more pathology than do the more representative members of the same profession." He qualifies this finding by stating "... We should expect to find an enhancement of 'Ego Strength in our creative individuals, so that greater psycho-pathology and greater personal effectiveness would exist side by side. Psychometrically, such a finding would be quite unusual; ... Nevertheless, just such an unusual pattern is found, not only in relation to ego strength but in relation to the scales of the CPI, most of which are themselves aspects of ego strength and negatively related to the psychopathological dimensions measured by the MMPI."

His basic hypothesis is probably revealed by his findings reported when using the 'impulsivity' scale of the CPI, where he found that 'originals' scored higher than unoriginals; they were able to act upon impulse, but control it. Barron states "Originality flourishes where suppression is at a minimum and where some measure of disintegration is tolerable in the interests of some final higher level of integration." The 'regression in the service of the ego' concept, related to these findings, has been noted earlier.

Barron's (1967) study of the 'creative writer' found similar characteristics. His summary shows that the creative personality showed, on the MMPI and CPI, high on Ego-Strength. On the CPI the creatives showed high on Flexibility, self-acceptance, social presence, achievement through independence and psychological mindedness, they scored low on good impression, achievement though conformance, communality, and socialization.

MacKinnon (1962) reported similar findings using the MMPI and the CPI. He stated "... in the ... MMPI profiles of many of our creative subjects, one can find rather clear evidence of psychopathology, but also evidence of adequate control mechanisms..."

MacKinnon also found that "... the most striking aspect of the MMPI profiles of all our male groups is an extremely high peak on the Mf femininity scale." He found the same with the masculinity-femininity scale of the CPI.

The MMPI and the CPI are reasonably easy to administer and score, and are intended for 16 years and upward. They are basically 'psychopathological' tests, however, and more suited for those trained in clinical psychology. At present no scales or profiles for 'creativity' itself are provided.

The 16PF, HSPQ and CPQ

These well known tests, developed by Cattell (1963) are in general use for a variety of purposes. They are easy to administer and score, and a number of Second Order Factors and profiles are available. Among these is one on 'creativity' (Information Bulletin No.10:1963).

The HSPQ and the CPQ have been developed for older and younger children particularly, and are thus suitable for use in research in schools. Though clinically based originally, many of the scales and profiles derived more recently are concerned with educational and social factors; e.g. school achievement, interest in sports, capacity for leadership, delinquency, and behaviour problems, in addition to more usual profiles such as extraversion/introversion.

The 16PF creativity profile is revealed as a person who scores high on factors B (Intelligence), E (Assertive), H (Venturesome), I (Sensitive), M (Imaginative), Q1 (Experimenting), Q2 (Self-sufficient); and low on factors A (Reserved), F (Serious), and N (Forthright). For the HSPQ Profile, factors M, N, and Q1 are omitted; for the CPQ profile factors M, Q1, and Q2 are omitted.

The absence of the M factor in the HSPQ and CPQ is possibly unfortunate in view of the fact that Cross et al (1967), as reviewed previously, found

that this was probably the 'creativity' factor par excellence.

Cattell and Butcher (1968) found that factor E - which is included in the HSPQ and CPQ - was particularly important, and that Q2 - included in the HSPQ only - was also indicative of creative ability. The concept of introversion, as revealed by the HSPQ and CPQ, has been mentioned previously (p. 47) and is considered a factor in the creativity syndrome, though Cross et al (1967) found no generalizations concerning introversion could be inferred.

Criticisms of 'personality inventories' such as the 16PF, and MMPI, etc. have been made. For instance Holland (1962) considered the validity of personality inventories to be generally low. Anastasi (1966) considered that "Despite the extensive research conducted by Cattell and his associates over a period of twenty years, the traits proposed by Cattell must be regarded as tentative." She also considers that the reliability of the tests is low and thus suspects their validity.

In spite of these criticisms however, personality inventories have proved useful 'additions' to the psychologist's armoury of tests, and helpful as an initial 'screen' or confirmatory instrument to be used in conjunction with other methods of identification.

### (iii) TESTS OF 'CREATIVITY'

Tests of 'creativity' itself are often 'work samples'. The subject is expected to produce something as a result of a stimulus, e.g. a question or situation, and his production is 'scored' on factors relevant to creative production, or creative personality.

Such tests are considered the opposite of the IQ type of test, where the subject is expected to 'converge' on one correct solution. In the Creativity test the subject 'diverges' and may give a number of answers or solutions, of an unusual nature, to the 'open ended' situation or question.

The testing of mental abilities interested many investigators. IQ testing led to the realization that intelligence, as measured by the IQ tests did not tap all of the mental abilities.

Thurstone (1938), and other early investigators in this field, found a group of factors that were called 'primary mental abilities'. Among the most frequently corroborated were: W: Word Fluency, N: Number, S: Space, M: Associative Memory, P: Perceptual Speed, I (or R): and Induction (General Reasoning)

Tests were based on these, e.g. the SRA Primary Mental Abilities, and the Differential Aptitude Test, but on the whole such tests still tended to measure 'convergent' thinking. Some measures of 'fluency' were included however. The majority of IQ tests, however, concentrated on 'verbal' abilities.

A well known test of association is the Remote Associates Test (RAT) developed by Mednick (1962).

An example of the type of item comprising the thirty items of the RAT is: "Surprise Line Democratic." The subject has to find the right word that associated with each of the words provided. The 'right answer' in this case being "Party". It can be seen that not only is there a 'correct' answer but, to some extent, it is culturally biased. However, Houston and Mednick (1963) found that creative students revealed a "strong 'need' for associative novelty."

Cropley (1967) has stated "... there is evidence ... which suggests that the RAT is more related to conventional verbal skills than to divergent thinking, and that the associational theory of divergence is probably inadequate." Cropley used the RAT as one of a battery of tests in a study involving Canadian children.

One 'non-verbal' test of perception is the Gottschaldt Figures Test (cf. Anastasi 1966). This has been used by MacKinnon (1970) in his study of architects. He found that architects obtained the highest scores using this instrument. This test is also basically a test of 'convergence' in that there is one 'correct' answer; the subject has to identify a 'geometric figure' shown in isolation on the left, 'hidden' in complex patterns shown on the right. To a certain extent this is similar to the 'culture free', 'Progressive Matrices' type of IQ test in general use today. The Gottschaldt Hidden Figures test purports to measure 'flexibility of closure'.

The two factors of association and flexibility that these tests attempted to measure are only two of the many factors that are postulated as being indicative of creative thinking; but they were among the first to be measured.

An investigation into the deterrent effect upon flexible thought of 'Einstellung' or 'set' was performed by such researchers as the Luchins's (1950) ; whose Water Jar Test has been used by researchers in creative thinking. Though their research was primarily concerned with mathematics, they found that teaching which led to 'mechanization' of thought was not giving children an insight into mathematics. As they state "What are needed are teaching methods which will lead to understanding of the structural qualities of mathematical concepts and encourage productive thinking." The relevance to the concept of 'flexibility' in creative thinking is obvious.

The contribution made by J.P.Guilford, in the field of testing for 'creativity', is considerable. His main interest has been to show that IQ tests only measure a part of the whole range of intellectual skills; and that abilities involved in 'creative thinking' are different from those measured by conventional IQ tests.

Guilford (1950; and many subsequent works) postulated that unless abilities to think creatively were detected in scientists and technologists, America would fall behind in opening up new fields; e.g. space travel.

His factor analysis of numerous intellectual abilities, and the 'Structure of Intellect' based on these findings, is well known, and his findings with regard to 'sensitivity to problems', 'evaluation', and 'divergent thinking' have been mentioned earlier.

Guilford devised tests to detect and measure fluency, flexibility, originality, elaboration, and, to some extent, sensitivity to problems. These well known tests have been used or adapted by many investigators in the field of creativity; in particular the 'Uses' type of test - often used to measure



'originality' as well as flexibility- such as the uses of a 'brick' or a 'hammer'.

A concise summary of these tests is given by Cropley (1967: in Appendix B).

#### The Minnesota Tests of Creative Thinking (MTCT)

Tests of creativity, based on the work of Guilford, were developed at the University of Minnesota, particularly by Torrance. The success of such tests as the 'uses of a brick' (used by such investigators as Maltzman, Mednick and Osborn) was a spur to such development.

The MTCT, though based on Guilford's concepts, used some tests which were, as Cropley (1967) states "... quite different from the kind of tests Guilford first designed."

Goldman (1964) describes the developed version of the MTCT, as it was in 1962. The battery of tests was constructed in three sections:

A. Non-verbal Tests, B. Verbal Tests using non-verbal stimuli, and C. Verbal Tests using verbal stimuli.

Briefly, the format of the tests was as follows:-

#### A. NON-VERBAL

1. Incomplete Figures Task
2. Circles Task
3. Picture Construction Task
4. Creative Design Task

#### B. VERBAL TASKS USING NON-VERBAL STIMULI

1. Product Improvement
2. Unusual uses
3. Ask and Guess Test
4. Sounds and Images

#### C. VERBAL TESTS USING VERBAL STIMULI

1. Unusual Uses
2. Impossibilities
3. Consequences
4. Common Problems
5. Imaginative Stories
6. A test Battery: comprised of Figure Completion, Circles, Product Improvement and Unusual Uses (used to ascertain which tests may be suitable for different ages and populations of subjects).

The tests are scored where possible, for Fluency, Flexibility, Originality and Elaboration.

The scoring was difficult to develop; as Goldman pointed out "Since there is no one correct answer scoring must be difficult and cannot be purely mechanical." Some of the tests can be scored simply, e.g. 'fluency' (the number of responses), others, such as 'originality' (deviation from 'norm') requires training or very detailed instructions.

Goldman criticised the tests, therefore, with regard to their validity and reliability; though Torrance had given data on the reliability: Fluency .76, Flexibility .72, Originality .81, and Elaboration .89. With regard to the validity Goldman considered that the MTCT may not measure creativity "unless we can show that they distinguish between adults and children known on other grounds to be creative."

One of the most comprehensive and objective scoring systems devised for the MTCT is that developed by Yamamoto (1964).

The scoring is based on the same factors of Fluency, Flexibility, Originality, and Elaboration.

In the Experimental Scoring Manuals for the MTCT, Yamamoto gives scoring for two groups of tests; Verbal Tasks, and Nonverbal.

#### VERBAL TASKS

1. Ask and Guess Test: Ask.
2. Ask and Guess Test: Guess Causes.
3. Ask and Guess Test: Guess Consequences.
4. Product Improvement: Toy Dog.
5. Unusual Uses: Toy Dog.
6. Consequences.

#### NONVERBAL TASKS

1. Picture Construction.
2. Figure Completion.
3. Circles.

Scoring procedures for all four factors are given for the tests and Yamamoto also includes data on reliability, validity, and norms for specified populations; and lists a number of studies in which this scoring system was employed. Among these are studies by Torrance (1962a) Yamamoto (1964a) and Wodtke (1964).

Wodtke (1964) correlated scores on the MTCT with results obtained using

the Luchins Water Jar Test and a Measure of Imaginative Writing. He found that the reliability of the MTCT was fairly low, but thought that the tests were suitable for research purposes at this stage.

Torrance brought out in 1966 his own final production version of tests similar to the MTCT. These are known as Torrance Tests of Creative Thinking (TTCT). The scoring for these tests has been taken to a further stage of objectivity, reliability and ease of scoring.

There are Verbal and Figural batteries; in two equivalent forms, A and B.

Torrance has stated, regarding the development and scoring rationales, "Figural and Verbal Tests A and B represent a rather sharp departure from the factor type tests developed by Guilford and his associates. The author has made deliberate attempts to construct test activities that are models of the creative process, each involving different kinds of thinking and each contributing something unique to the batteries under development. ... An attempt is made, however, to assess the products that result from the administration of these test activities in terms of Guilford's divergent thinking factors (fluency flexibility, originality, and elaboration)."

The Verbal Battery consists of seven tasks requiring 45 minutes working time, in addition to time necessary for orientation, passing out booklets, and giving instructions.

The 'activities' in the Verbal Battery are:

Ask and Guess Activities: Three tests - Asking, Guess Causes, and Guess Consequences Activities.  
Product Improvement Activity  
Unusual Uses Activity  
Unusual Questions Activity  
Just Suppose Activity

The Figural Battery consists of three activities requiring 30 minutes administration. Torrance has stated "In designing them, the author made a deliberate effort to obtain a maximum of information from a minimum of testing time." As the total time involved, including handing out booklets, giving

out instructions etc. is only 45 minutes, this has certainly been achieved from the 'time' point of view.

The Activities in the Figural Battery are:

1. Picture Construction Activity - the subject sticks a gummed shape on the page, and using this as a stimulus, turns it into a picture of his own choice. This is scored for Originality and Elaboration: as there is only one response, Fluency and Flexibility are not involved.
2. Incomplete Figures Activity - the subject is given ten panels each containing a 'stimulus' line. He completes each panel, forming his own picture for each, and elaborates it. This activity is scored for Fluency, Flexibility, Originality, and Elaboration.
3. Repeated Figures Activity (Circles or Lines) - the subject turns each circle or pair of lines into objects etc. of his own choice. Circles or pairs of Lines may be 'linked' for responses. This activity is also scored for Fluency, Flexibility, Originality, and Elaboration.

For each of these activities the subject is asked to give a 'title', which may be scored, if wished, for activities 1 and 2 only, for Originality.

Scoring for the four factors is similar to that for the MTCT but the directions are clearer and the 'weighting' for the majority of responses is clear. Provision is also made for unforeseen responses, and 'categories' for these can be added.

Originality is scored according to lists of responses showing deviations from normal; weightings being 0, 1, 2, or 3, according to the test involved, for each response.

Elaboration is scored by giving 1 point for each addition, beyond the essential minimum response, for each response.

Fluency is simply the number of responses to Activities 2 & 3 i.e. completed responses.

Flexibility is scored according to 'categories'. I.e. several responses may be in the same 'category'. Flexibility is therefore the number of 'categories' found in the responses to Activities 2 and 3.

The scores on each factor may be summed to give Total Fluency, Total Flexibility, Total Originality, and Total Elaboration.

The TTCT (Torrance Tests of Creative Thinking) Figural Battery has been reviewed in detail as it is an instrument that is obviously concerned with

'visual' creativity, and therefore relevant to the present study to a greater extent than Verbal tests.

A number of studies have used the TTCT as a measuring instrument, many of them are mentioned in the Norms-Technical Manual (1966), and others reported in journals. Comparison group 'norms' are provided in the TTCT Manual, including some norms for school children.

The tests are easy to administer and score; and can be used with groups of children in a short time. This probably accounts for their popularity.

Mention has also been made earlier of the 'creativity' tests devised and used by Wallach and Kogan (1965). They criticised the 'Guilford type' tests, such as the MTCT and TTCT, on the grounds that they provided an artificial 'test' situation and had a 'time limit'; these types of test were therefore, not likely to be valid, as 'creativity' cannot flourish if it is bound by 'time' and 'test situations'.

The tests they developed involved establishing a 'rapport' before the 'tests' were administered. There was no time limit involved, and each subject was tested individually by an experimenter he had learned to know and trust.

The tests themselves required 'verbal answers' to verbal or non-verbal stimuli, similar in many respects to the 'Guilford type' test.

The Wallach and Kogan Tests are:

#### VERBAL

1. Instances: Generate many instances of a class, e.g. Name as many round things as you can."
2. Alternative Uses: Give as many uses as you can for a common object (e.g. knife, newspaper).
3. Similarities: Give ways in which specified objects are alike (e.g. potato-carrot, cat-mouse).

#### NON-VERBAL (Note: 'stimuli' are non-verbal designs on cards)

1. Pattern Meanings: Suggest interpretations to abstract designs.
2. Line Meanings: Give interpretations to single continuous lines.

The tests are scored on two factors: 'uniqueness' (unusual to the group being tested), and 'number of responses' (i.e. Fluency).

Wallach and Kogan found that the tests correlated highly with each other, not with measures of convergent thinking.

The disadvantages of the Wallach and Kogan tests are mainly administrative i.e. length of time, and type of experimenter needed to establish 'rapport'.

Cropley (1967) has said "... these tests will prove to be most valuable in future investigation in the area of creativity. However it is unlikely that the work of Guilford or Torrance will be completely disregarded, especially in view of the heavily derivative nature of Wallach and Kogan's tests."

Hudson (1966) also devised 'open ended' tests based on Guilford's concepts. Four of the tests he devised were:

1. Uses of Objects: barrel, paper clip, tin of boot polish, brick, and blanket.
2. Meanings of Words: bit, bolt, duck, fair, pink, fast, pitch, port, sack, tender.
3. Drawings: a picture entitled 'zebra crossing'.
4. Controversial Statements: 24 statements, e.g. Science Fact will soon be stranger than Science Fiction, Truth, in matters of religion, is simply the opinion that has survived. Subjects pick the statements that interest them and comment in any way they wish.

Scoring for the first two tests is similar to that for Fluency, Flexibility and Originality in Guilford type tests. The scoring for the other two tests, is, as Hudson puts it "... much more a matter of judgement.."

There are a number of investigators into creativity who have developed tests based on Guilford's principles, but those reviewed above, particularly the MTCT and the TTCT, have been useful in a number of research projects.

As was observed earlier in the review, few objective criteria for measuring 'creativity' in the 'visual arts' have been developed. Beittel and Burkhart were, perhaps, exceptions in this visual area.

Burkhart (1960:1962), as was mentioned earlier (P.35 ), has developed a measure of creativity based on his Spontaneous and Deliberate concepts.

Burkhart devised a chart for the identification of Spontaneity and Deliberateness in art, and a Scale of Spontaneity and Deliberateness in Art. The chart and scale are as follows:

#### ATTRIBUTES FOR THE IDENTIFICATION OF SPONTANEITY AND DELIBERATENESS IN ART

##### SPONTANEOUS HANDLING

Blurred or rough contours  
Active or dynamic Handling  
Bold or rugged surfaces  
Loose and free forms  
Variety in the use of detail  
Flexibility in the treatment of the whole  
Functional use of the white of the paper

##### DELIBERATE HANDLING

Sharp or clean contours  
Static or rigid handling  
Redefined or polished surfaces  
Tight or restricted forms  
Repetition in the use of detail  
Rigidity in the treatment of the whole  
Full coverage of the paper surface

With regard to these two types of handling in art works Burkhart (1962) has stated "These distinctions are best judged by physically recreating the execution of the work so as to sense the manner of handling".

#### SCALE OF SPONTANEITY AND DELIBERATENESS IN ART

The Scale is basically considered in two parts, spontaneous and deliberate; and subdivision takes place within each part.

Burkhart illustrates the scale with examples in colour, and further elaborates the concepts with drawings illustrating analytical visual-verbal judgements on factors: Variety in use of materials, Exaggeration, Dramatic contrast, Complexity, Gradation of values, Non-spatial to spatial, Variety of shapes in patterns, and Organizational unity.

The scale itself is as follows:

SH+	Spontaneous High Plus
SH-	Spontaneous High Minus
SL+	Spontaneous Low Plus
SL-	Spontaneous Low Minus
DH+	Deliberate High Plus
DH-	Deliberate High Minus
DL+	Deliberate Low Plus
DL-	Deliberate Low Minus

NOTE: It must be pointed out that, though Burkhart tends to imply that spontaneity is related to creativity, works of art that are aesthetically satisfying may be either spontaneous or deliberate; and Burkhart is at pains to avoid bias on the side of the spontaneous work when he states "... the

name 'deliberate' seems preferable here because of the negative connotation associated with rigidity," and "...it is certainly not the intention of art education to teach our pupils to work in any one way, spontaneous or deliberate."

Burkhart (1962) gives two useful definitions, derived by Gogel, for identifying Deliberate drawings and Spontaneous drawings:

DELIBERATE DRAWINGS in general appear to be more detailed and angular and are drawn with short, definite, studied lines. The over-all effect ranges from crude, stiff, or confidently made lines to lines which are distinct, refined and polished. The drawings appear to be static and imply movement mainly though the detailed content pattern or organization or by lines pointing in a specific direction.

SPONTANEOUS DRAWINGS in general appear to lack specific detail and are often drawn with lines that are long, free or boldly made. The over-all effect ranges from indecisive and vague lines to impulsive, vigorous, and energetic lines. The drawing lines themselves appear to be active and effortlessly made and indicate movement though loose, flexible, restless lines without regard to content.

Drawings illustrating Gogel's 'Spontaneous and Deliberate Line Drawing Scale' are also shown by Burkhart.

Burkhart has developed a test of 'divergent thinking', similar to those devised by Guilford, as he considers divergent power is of critical importance for creativity. The test lasts for fifteen minutes, and the subject has to make up questions concerning an object, such as a 'paper clip'. Scoring appears to be according to the number of non-factual questions made up by the subject, e.g. "Why might a paper clip be odd-looking to a fly?".



## SUMMARY

Inspection of the literature has revealed that there have been many varied approaches to the measurement of creativity.

Tests have been based on visual art judgements in the aesthetic field, e.g. the Meier Art Judgement Test, the Graves Design Judgement Test, and the Barron-Welsh Art Scale - mainly concerned with the symmetry/asymmetry dimension.

Tests of creative personality have been developed, such as the creativity score of the 16PF, HSPQ, and CPQ, and psychological tests such as the Rorschach, TAT, and MMPI have been used in studying creative persons. Adjective Check Lists and Vocational Interest blanks have also been used.

Tests of 'creativity' itself, particularly in terms of Fluency, Flexibility, Originality, and Elaboration, have been developed by such researchers as Guilford and Torrance and their associates. The MTCT and TTCT are tests that have been developed to a high degree, and are simple to administer and score. The Wallach and Kogan Tests, though probably more reliable, are difficult to administer in field research and are derivative. Burkhart has devised scales and methods of identifying spontaneous and deliberate production in visual art.

Though the degree of validity and reliability of many of the measuring instruments is still low, they can be useful in research situations.

## C: METHODS FOR INCREASING CREATIVITY

'Creativity' is dependent upon the individual's total personality and the environmental conditions prevailing, as has been revealed in the review of the creative person and creative process.

It is not possible, at the present, to control an individual's development, either in the area of heredity or the environment, so that he will be very creative. Attempts can be made, however, to increase any creative ability that is present; no matter how 'latent' this ability may be.

Attempts to increase creative ability have been made in the fields of education, technology, commerce etc. with varying degrees of success. In education it is possible, to a limited extent, to attempt to increase creativity through environmental influences, though this is only really effective where the whole establishment is involved.

The majority of attempts in industrial and educational fields have been made by trying to influence factors in the creative process in the areas of Preparation, Incubation, Illumination, and Verification.

Many methods were developed, in the first instance, to test theories concerning the creative person, process or product; e.g. the discovery of such factors as fluency, flexibility, or originality, has led to the development of methods of increasing creative ability as measured by instruments concerned with such factors.

It must not be thought that every 'increase' in creativity can be measured or become immediately apparent in some way. The result of any increase in creative ability may be seen in the future; it may not, as was pointed out earlier, be recognised until long after the creative person has died. For practical purposes, in experimental situations, for example, many of the measures considered in the previous part of the review can provide some indication of any increase in creative ability in those factors that are measured by a particular instrument.

Many of the methods devised to increase creative ability are attempts to

influence processes that were considered to be important to the 'Incubatory stage' of the overall creative process. Such processes, based on adequate 'preparation', are combining, building, associating, boundary-pushing; all involving factors such as fluency, flexibility, originality, and elaborative ability. Attempts have been made to improve processes of 'verification' in creative areas, though there are few of these.

Two main approaches have been made in attempts to increase creativity. The first is concerned with creating environmental conditions or eliciting mental attitudes that are conducive to creative thinking. The second approach is concerned with attempts to increase creative ability by implementing or extending the use of actual thinking processes i.e. increasing the individual person's fluency, flexibility, originality etc.

In both approaches attempts have been made to realise the concept of 'regression' in terms of 'deferment of judgement'. Various methods of doing this have been developed; e.g. Brainstorming, Synectics, and Trigger-Symbols.

The literature will therefore, be reviewed in two main areas:

1. Influences on Environmental Factors. and 2. Influences on Process Factors.

Though these appear to be different areas, many of the actual methods developed in one area may encroach upon the concepts and methods devised in the other.

#### 1) Influences on Environmental Factors

The majority of attempts to develop an environment that is conducive to an increase in creative ability have been made in educational fields. A few such proposals are reviewed here.

Some concepts are based on ideas for developing the 'creative personality' and are often 'Prescriptions' for the individual who wishes to become more creative, or for use in educational situations.

Arnold (1962a) proposes the following 'Program for Personal Development':

1. Know yourself as well as possible.
2. Carry a notebook and use it.
3. Ask yourself a new question every day.
4. Develop craftsmanship in your own field.
5. Read and broaden your interests.
6. Develop creative avocations.
7. Provide permissive atmosphere for family and colleagues.

8. Develop a sense of humour.
9. Speculate and daydream
10. Question - Observe - Associate - Predict.

The last suggestion involves what Arnold regards as the four 'key-words' in the educational process.

These statements are indicative of ways to remove 'blocks' to creative thinking that are found in many educational and industrial situations, and constitute an attempt to enable the individual to restructure his environment, and to a certain extent his personality, so that it is conducive to creative activity.

Torrance (1962b) gives a list of twenty ways of encouraging creative thinking in school; summarized as follows:

1. Value Creative Thinking.
2. Make children more sensitive to environmental stimuli.
3. Encourage manipulation of objects and ideas.
4. Teach how to test systematically each idea.
5. Develop tolerance of new ideas.
6. Beware of forcing a set pattern.
7. Develop a creative classroom atmosphere (use anything they wish and have a permissive classroom).
8. Teach the child to value his creative thinking, use a memo-notebook as an 'idea trap' for good ideas.
9. Teach skills for avoiding peer sanctions.
10. Give information about the creative process.
11. Dispel the 'sense of awe' of 'masterpieces'.
12. Encourage and evaluate self-initiated learning.
13. Create 'thorns in the flesh'.
14. Create necessities for creative thinking.
15. Provide for active and quiet periods.
16. Make available resources for working out ideas.
17. Encourage the habit of working out the full implication of ideas.
18. Develop constructive criticism - not just criticism.
19. Encourage acquisition of knowledge in a variety of fields.
20. Develop adventurous-spirited teachers.

If all these ideas could be implemented they would undoubtedly have a beneficial effect on creativity, such implementation is not always practical in the normal type of institutional structure of today. However, attempts could be made to adopt some of these concepts in many situations found in educational fields.

One attempt to encourage students to think more creatively was that devised by Brown (1964). He was interested in providing a 'trigger-symbol' that would start his students acting in a creative way. When the 'trigger'

was used (the trigger in this study was the name 'William Elephant') the subjects were expected to think in as creative a way as possible. Discussions on creative ideas etc. had always been associated with the 'trigger' in a variety of situations and subjects: e.g. influence of the environment (light, colour, music, textures, et.), actual creative processes (brainstorming etc.) during discussions on books, ideas etc.

The results of the experiment showed that the experimental group (who used the 'trigger symbol') gained on the Barron-Welsh Art Scale. Significant F. values indicated that in this case a 'trigger symbol' was effective in eliciting creative thinking.

Kneller (1965) states "During the preschool years the major brake on creativity is the tendency to shorten the period of play and imagination. ... Parents and teachers, then, have a responsibility to keep alive the child's capacity for fantasy until it can mature into sound creativity." This is a strong plea for a more creative approach to teaching, but also emphasizes the role of the parent in pre-school training.

Kneller thinks that there are two ways in which to introduce creativity into formal education. "One way is to teach it as a new subject or skill. The other is to modify the present curriculum. Either we teach creativity in its own right or we draw upon the creative potential in all the subject matter we treat."

Kneller considers various factors involved in creative thinking which he feels could be dealt with in the educational situation: Originality, Appreciation of the New, Inventiveness, Curiosity and Enquiry, Self-direction, and Sense Perception.

A brief summary of the methods he suggests for each factor are:

**Originality:**

Welcome, and 'tease out' original ideas. Respect ideas and don't censor them too quickly. Suit demand for originality to the subject: i.e. it should be relevant.

**Appreciation of the New:**

Sustain student's delight in novelty; temper conventional attitudes as student matures. Show how revolutionary many new ideas seemed when they first appeared. Stimulate the student to think up new answers or novel questions.

### Inventiveness:

Encourage spontaneous expression; forget relevance at times. Use problems that can be solved at school. Use stimuli as a spur to the imagination. Encourage fluency - generate a range of ideas on a given subject. Challenge students with provocative ideas. Keep a record of ideas and hand in 'most valued' for evaluation. Show how creators from previous eras have worked.

### Curiosity and Enquiry:

Whet the student's curiosity: constantly probe and unsettle - ask questions such as "What would happen if...?" "What would it be like if?", etc. asking questions that might affect basic conditions.

Seek out ideas that challenge beliefs. Press 'insights' to a conclusion. Stand by ideas and cultivate self-discipline to test them. Submit ideas to the public. Draw implications from general laws and principles. Learn 'key concepts' in the arts, the sciences and the humanities.

### Self-direction:

Not only create but 'verify' own ideas. Learn skill and knowledge of discipline from authority, but put these to use on own projects. Learn on own initiative; and make one's own mistakes.

### Sense Perception:

The teacher should attempt to raise the level of the students' sense perception and to value their own sensations; e.g. by noting such experiences and communicating them. This leads to appreciation of sensitivity in works of art, and to other people's feelings.

Many ideas such as those given by Kneller and Torrance are being used in some limited way in schools. It is very doubtful, however, if any curriculum development, particularly in secondary schools, at present is aimed at developing 'creativity' throughout the curriculum.

Certain types of 'permissive' schools, e.g. of the 'Summerhill' type, are supposed to provide the type of freedom conducive to development of creative ability. It is not at all certain, however, that such freedom does act in this way.

Hudson (1966), though not primarily concerned with developing creativity, appears to be advocating the use of more unconventional methods in education in order to stimulate creative activity. In his study, mainly concerned with 'divergers' and 'convergers', he states "Conventional education is hostile to creativity. Progressive education is not." He goes on to say "That conventional education is uncongenial to independent spirits seems to me incontestable: also that much of what passes for education in this country and in the United States is a waste of everyone's time, pupils and teachers alike."

However, in contradiction, he doubts the advisability of radical, progressive education when he says "On the other hand, such conclusions are not entailed by the evidence that we now possess. The harsh fact remains that ... men like Darwin and Einstein, who were unhappy or undistinguished at school, nevertheless produced the theories of evolution and relativity."

Hudson draws three conclusions from his studies of this area.

1. Such creators survive through luck, but thousands of others, of equal potential, are oppressed and extinguished.
2. The unhappiness of these creators was a causal factor in making them great.
3. Their unhappiness was "...concomitant but not causal: they were unhappy because they were remarkable, but their unhappiness did not affect their creative potentialities one way or the other."

Hudson is concerned to point out the importance of creativity in 'every day' life, and to ensure that the smallest spark of creativity is allowed to grow into a flame. The problem is to create an environment that will do this. It is not certain that the 'Progressive, permissive' type of environment is that most likely to do this. As Hudson puts it "My own suspicion is that progressive schools do make most children happier than authoritarian ones: but that they withdraw from children the cutting edge that insecurity, competition and resentment supply."

Much more research, in controlled experiments, is required before the most suitable types of environment to stimulate creative ability are found.

Strasser (1967) gives two lists that he thinks will elicit more creative thinking in the educational situation. These are particularly directed to the 'classroom' situation, and do not, of necessity, require a particularly 'permissive' environmental situation throughout. The lists, briefly summarized are:

#### A. Asking Questions

1. Mutual self-discipline and respect for each other's ideas:
  - (a) All ideas valid (teacher and child)
  - (b) One person talks at a time - no interruption.
2. Probe beyond yes/no answer/Question.
3. Does learner see specificity, responsibility, what is expected of him regarding question.

4. Will it lead to development of purpose (stimulate thought, research experiment etc.)
5. If the teacher continually summarizes or concludes the children will not learn the skill.
6. Teacher responds positively to the childrens' questions:
  - (a) may take a new direction
  - (b) note question for future consideration
7. Wait after asking questions
8. Different kinds of question (for different objectives) predict, design experiment, validate, interpret, explore, etc.
9. Do not name a child - it removes responsibility from the others
10. Value questions that do not have a 'correct' answer.

B. Reacting to Responses (Accept, Clarify, Challenge, Support)

1. Do not repeat child's comments - let others hear him
2. React positively
3. Don't answer own questions (tell, not ask, when necessary)
4. Let children test their own ideas themselves - even if not productive.
5. How do you react to a right/wrong answer?
6. Provide time for more than one child to respond
7. What answer do you expect? Verbal response: idea: overt behaviour?
8. Do you reply so as to avoid 'subverbal cues'? a) accept replies even after 'correct' one given b) agree with wrong or vice-versa, c) react only to 'correct' answers.
9. How are correct answers determined; is it always the teachers job to pass judgement?

These two lists are interesting, and, if fully implemented, should tend to increase the childrens' ability to think for themselves, and provided there is a degree of creative ability present, create an 'atmosphere' in which creative thinking could flourish.

Cropley (1967) has postulated that four targets are necessary in an educational system to increase creative ability. Educational methods should "...foster:

1. The transfer of training across subjects:
2. The finding of unifying principles, which demonstrate the relatedness of knowledge usually held to be separate:
3. the ability to see facts in a new light and to question what is usually held to be self-evidently true; and
4. the ability to see analogies and to exercise imagination, since these are the kinds of skills which contribute to the process of creative thinking."

Such aims obviously require the involvement of the whole educational establishment and total co-operation of all teaching staff. It is not likely to be realised, in total, in the normal school at the present time.



While such ideas are filtering through the educational pyramid, researchers must be content to work within narrower limits in the school situation.

#### Increasing Creativity in the Visual Arts.

There is little in the area of the visual arts that is concerned with increasing creativity per se. The majority of people consider that all visual art work is 'creative'. It may be true that the percentage of 'creative' work found in the visual art field is higher than that in other fields. e.g. mathematics (though even this example is dubious), not all visual art production is creative in the true sense. The true innovator in the arts can certainly be termed 'creative' but the artist who is extremely derivative, e.g. the 'week-end' painter who churns out 'impressionists' is rarely creative in any significant way. As was noted previously, criteria for judging creativity, as opposed to aesthetic qualities, in the visual arts are as lacking as they are in other fields of creative activity.

Methods for stimulating creative ability in the visual art field, are therefore, just as necessary as in fields of science, and the humanities.

Hausman (1963) has put the problem concerning instruction in art when he says "The essential paradox is that of teaching within a tradition which requires expanding beyond that tradition." This is essential in developing creativity, but it is a sad fact that even in the 'art schools' such expanding of tradition is often not considered; though some headway has been made in recent times in this area.

Montgomery (1959) studied factors affecting creative work in groups. He organized data along four 'continua':

1. Permitting - Preventing.
2. Inviting - Repelling
3. Focussing - Diffusing.
4. Supporting - Depressing.

He also studied the effect of Time/No Time Pressure, and Waste and Error/No Waste and Error on subjects working in the four conditions.

He found that the more permissive environment (Permitting, Inviting,

Focussing, Supporting) was conducive to creative work. Students who felt psychologically 'safe' and 'free' were more creative.

Rogers (cf. Hausman 1963) suggested this 'safety' could be achieved by the implementation of three conditions:

1. Accepting the individual as of unconditional worth.
2. Providing a climate in which external evaluation is absent.
3. Understanding 'empathically'.

There have been a few attempts to improve the creative ability of children in the field of visual art. The work of Lowenfield, Brittain, Beittel, and Burkhart has been valuable in this area.

Lowenfield (1947) has said "Without question one of the prime objectives of any art programme is the development of individuals who are creative thinkers."

This is a statement with which most art educators would agree, but it is doubtful if any real attempt has been made stimulate such creativity until recently.

The superb symbolic 'vase' that has appeared in many of the cartoons by 'Giles' (e.g. Appendix P.1 ) where he has been concerned with an educational situation, is an indictment of the type of 'art teaching' that was considered sufficient until recently; i.e. where the pupil is simply told to 'draw that'. This type of teaching is still typical, one suspects in some schools.

This is not say that 'representational art' (or 'docum' as it is sometimes called) has no part to play in school or the wider sphere of art. It should only be emphasised when the 'child' himself needs it, either because he asks for it or sympathetic inspection of his work indicates that he needs it.

Visual art is not removed from 'reality', but childrens' art should display that reality that a child creates for himself from his symbolic management of his environment. This will vary according to the personality, and the stage of development reached, of the individual child.

This is largely the message that Lowenfield has for the field of art education.

Lowenfield has found most of the factors associated with creativity that other researchers have found, including the concepts of convergence and divergence. He feels that "Both kinds of thinking should be developed."; the needs of the converger, who is more concerned with objective, aesthetic, or material factors, need to be catered for as well as the needs of the more 'creative' diverger.

Lowenfield suggests the use of 'open ended' questions to stimulate creative thinking in the diverger, e.g. "Which colours make you sad?"

He also makes a valid point when he states "... the philosophy in art education is distinctly different from that of the so called fine arts. Whereas the emphasis in art education is on the effect that the creative processes have on individuals, it is the aesthetic value of the end product that is of importance in the fine arts." He thus places the creative process high in the educational situation. As he further states "Focussing upon the child, however, makes the creative process extremely important, not only to the potential artist but to every child, regardless of how or in what profession this creativity will be utilized."

Lowenfield feels that some important aspects of stimulating creativity lie in getting rid of factors that actively discourage it.

Adults too often judge a child's work from the standpoint of the 'art critic'; whereas, as Lowenfield puts it "Art for the child is merely a means of expression." This attitude may not be true in the more enlightened schools and among enlightened groups of people, but there are a great number of such discouraging factors, including examinations, that militate against the development of creativity.

'Colouring books' are still given to children by generous though thoughtless persons. Today there is a frightening proliferation of mechanical and

other devices. e.g. plastic 'design kits' ,draw figures kits, mould masterpieces, paint masterpieces (by numbers!), that have the effect of negating creativity, in that they are acceptable to adults as works of art, whereas the original, though perhaps aesthetically unsatisfying, work of the child's own mind is not appreciated. Lowenfield has stated "...imitation in any learning situation is only used as a means to an end, and never as an end in itself." It is unfortunate that it is often the imitations or products of such 'kits' as mentioned above that are regarded as the 'end' by a majority of adults.

The place of the child's own experience in his creative work is important. He becomes involved; Lowenfield says "... self-identification with experiences ...is one of the most vital assumptions for producing creativity."

He also considered the effect of 'media' upon creative production.

The attributes of an art medium should be:

- "1. The art medium must conform with the child's own desire for expression.
2. The art medium and art expression must become an inseparable whole.
3. No procedure or material should be replacable by another."

Lowenfield has no 'prescription' or 'programme' in objective terms for deliberately stimulating creativity, though he goes into detail in areas of aestheticism and identifying his well known 'visual types' and 'haptic types'. He does, as has been noted, reveal the 'state of affairs' in the visual art field; and his comments have opened the eyes of many in the educational establishments. Much of what he says seems 'obvious' - but only after he said it.

Burkhart's (1962) concept of Spontaneous and Deliberate work in the field of visual art has been reviewed previously in the area of identifying the creative person.

Burkhart has also been concerned with developing creativity in this area, perhaps using more psychologically based concepts in his approach to students as individuals. An example of this is seen in Burkhart's statement "When one

of the spontaneous high students asked his teacher for assurance that he would be successful in his next work, he said that it was helpful to be asked 'Why should you have a right which I am denied?' It was then clear to him that this was a form of fear which his teacher had come to accept as an inseparable part of the creative activity. Burkhart was dealing with mature students, rather than children, but basic truths such as these apply to all stages of development.

Burkhart has provided charts that summarize ideas for encouraging creative visual art production, for Spontaneous and Deliberate students. As an example of the help given in these charts the ideas in the 'Give' section for Spontaneous High and Spontaneous Low students reads:

Spontaneous High Student

Information about (standards)  
Inspiration  
Problem definition  
Divergent topics  
Self-evaluative activities.

Spontaneous Low Student

Guidance  
Problem definition  
Intermediate goals  
Information about (standards)  
Divergent topics  
Self-evaluative activities.

As can be seen, Burkhart's ideas are more in the nature of a 'prescription' to suit the personality; of either the spontaneous or deliberate student.

Burkhart does suggest that the deliberate students should be encouraged in creative work by extending their thought and experience into such areas as: Expression-diversity - by dealing with new problems, more personal expression, sensitivity, courage and daring, awareness of the emotional value of the creative process, and new viewpoints through divergent topics.

Burkhart does not give a detailed approach to increasing creativity in any one factor, however.

In one interesting study Burkhart et al (1962) compared the effectiveness

of a Depth method of Art instruction with a Breadth method. The findings challenge the concept that the greater a variety of media, subject matter etc. given to a pupil or student, the more creative he will come.

Although a student may prefer such 'breadth' methods of teaching, the evidence of this study suggests that pressure brought on subjects to adopt 'depth' methods may yield far greater rewards.

Burkhart states "There is, in fact, some evidence in this and in other studies by the authors that some kinds of activities that students appear to want and are insistent upon have little learning value for them, while some learning experiences that they show real resistance to have some educational value for them."

There is a valid point here, and Burkhart reinforces it when he says that three or four weeks work in a medium is too little to allow progress to be made; and that "... one of the important advantages of the depth method is that it makes observable progress an unavoidable issue, challenge, and instructional requirement."

Burkhart has also reported a study by Beittel in which he tested the effectiveness of 'analytical' (step by step) versus 'holistic' (entire process presented as a whole; without analysis of procedures) instruction.

It was found that the 'analytical' approach was more effective than the 'holistic' method for both spontaneous and deliberate students; though as the media chosen was pottery this may have had some bearing on the results.

Burkhart has also stressed the need for the use of 'divergent' questions for motivational purposes in attempts to increase creativity. Such questions "... require the student to look at the content area from a variety of viewpoints and to participate in an imaginative way in answering ..." When such techniques are used it is important to realise that there is no right or wrong in the case of most answers; as Burkhart points out "... the product must be evaluated in terms of the working processes involved."

In concluding this review of some major concepts and findings of Burkharts work, a statement he has made reveals his approach to increasing creative

ability "...an active concern about creativity can lead to its development, especially when the methods used permit students to become involved in open-ended projects and particularly when a full opportunity is provided through some experiences in depth to become aware of the intrinsic value of their own creative processes and products."

## 2) Influences on Process Factors

As seen in attempts to increase creativity by environmental influences, the various 'process factors' were involved, even if by implication only: some consideration was given to such factors as fluency, flexibility, and originality.

Attempts to increase creative ability by direct influence on process factors have, in the main, entailed setting problems that require the individual to 'use' the particular process factor or factors in which an increase in skill is desired. Such attempts have usually aimed at bringing several abilities into play, fluency, flexibility, combining, associating etc., at the same time. The 'trigger symbol' (considered above), individual ideation, group ideation, brainstorming, red light - green light, and synectics are examples of methods used for increasing creativity utilizing this approach.

As an example of attempts to deliberately foster creative thinking, the three concepts in problem solving suggested by Kogan (1962) are worth noting. Kogan states:

1. The conventional methods. Stating the precise nature of the problem; narrowing the problem so that empirical solutions occur - this may lead to trial and error regardless of how difficult the task becomes.
2. The method of general principles. May make use of apparently unrelated facts which have to be integrated into a whole. Association of specific idea with many ideas and situations.
3. The Approach method. A pre-formulated general problem and general solution which applies to the maximum number of fields. Its "terms

become mere symbols". This method is often used when it is "desirable... because of the obstinacy of the problem, to make the maximum use of knowledge of one field in another."

These concepts are realised in some of the methods mentioned; i.e. 'stating the nature of the problem and narrowing it.' 'using integrative and associative techniques', and 'general problems and general solutions - making use of knowledge from various fields; often in symbolic terms'.

The method that is best known, and has been most used, in attempts to increase creative ability by influencing 'process factors', is that of 'Brainstorming'. Other methods, that are similar or derivative e.g. synectics, buzz groups, are also considered under this heading,

#### BRAINSTORMING

Osborn (1953) was one of the first to develop the concept of 'regression' into a practical method for increasing creativity. His method of 'individual or group ideation', now more popularly termed 'brainstorming', developed from two premises:

1. Deferment of judgement
2. Quantity breeds quality

From these premises he developed the four basic rules for 'brainstorming' (individual ideation or group creative collaboration - will be termed brainstorming for convenience):

1. Criticism is ruled out. Adverse judgement of ideas must be withheld until later.
2. 'Free Wheeling' is welcomed. The wilder the idea, the better; it is easier to tame down than to think up.
3. Quantity is wanted. The greater the number of ideas, the more the likelihood of useful ideas.
4. Combination and Improvement are sought. In addition to contributing ideas of their own, participants should suggest how ideas of others can be turned into better ideas; or how two or more ideas can be joined into still another idea."

These rules are the core of brainstorming and have been utilised by many other researchers. Though referring to group brainstorming in this particular set of rules, the basic concepts apply equally for individual brainstorming. As Parnes (1962) has stated "A popular misconception exists that the deferred



judgement principle can be utilized only in group ideation. The fallacy of this impression is demonstrated by the fact that all the measurements in the current scientific investigations ... were made on the basis of individual thinking, not on group collaboration."

The idea of the 'red light'/'green light' acting as a stop/start switch for brainstorming is also a useful concept devised by Osborne. The 'green light' turns on the brainstorm session; all judgement is deferred; the 'watchers are withdrawn from the gates' as Schiller put it. The 'red light' stops this deferred judgement, and the ideas are 'evaluated'; this stage being of equal importance, as ideas, that are 'brainstormed' to find the best, must be used. The evaluation of such ideas is therefore vital to the process.

Clark (1958) has developed brainstorming, mainly for groups, to a considerable extent. Though his work was intended for commercial purposes, most of the techniques he adopted are equally applicable for use with other groups.

Clark refers to the importance of 'sensing the problem'. He considers two approaches to this. The 'Broad General Problem'; which can be compared to a 'Steam Shovel', where the problem is vague and therefore the answers are vague; and the 'Narrower Problem'; which can be compared to a 'Spade', where a particular problem is attacked and the answers are positive and practical.

The general problem is useful in that it reveals narrower problems when examining the wider field.

Clark provides some useful practical methods for realising the basic rules in brainstorming. He gives a list of 'Killer Phrases' that inhibit the brainstorm session. Implementation of these phrases would negate the first rule 'criticism is ruled out'. Clark therefore insists that such phrases as 'It won't work', 'We've tried that before', 'Too modern', 'Too old fashioned', 'Lets wait and see', 'Nuts' etc. must not be used.

A summary of the method used for brainstorming, as advocated by Clark, shows that more is involved than just getting a group of people together and telling them to think of answers to problems.

The idea behind a Brainstorm Session is to have a group of people, adequately prepared, to come together for a certain length of time, and produce as many ideas as possible whilst criticism is ruled out (i.e. following the four basic rules). The ideas must be recorded in some way. The record of these ideas is then examined critically at a later stage, and the best ideas sorted out and put into practice. It is important that the ideas are actually going to be used or the session may develop into an academic exercise.

As can be seen 'brainstorming' involves the majority of the stages in the creative process, i.e. preparation, incubation, and verification; and many of the factors found to be important in each stage. e.g. fluent, flexible, original thinking, utilizing such processes as association, combination, building, synthesis etc.

Many other process factor methods can be utilized in the actual 'green light' stage of the brainstorm method. Arnold (1962b) mentions such aids as 'check lists' and states "Question, Observe, Associate, Predict, is in effect the best check list for me, " but he advocates that one should devise one's own check list.

He also mentions the method of 'attribute listing' - each attribute of a product is listed, and then examined to see if any attributes can be improved upon.

Arnold also makes the comment that familiarity breeds contempt, and in this context states "... it is only the amateur or type who invents anything the expert knows too many reasons why something can't be done, so he never tries." This statement may be a little sweeping, but he makes a point which is particularly valid and relevant in connection with brainstorming.

Arnold considers that 'brainstorming' is a good method for increasing creativity, and that a number of studies have proved its worth. He also mentions that brainstorming is not only an activity for groups and says "...

an individual can form a brainstorming group with himself as the only member."

Parnes (1963) also mentions 'attribute listing' and the use of 'check lists' in brainstorming. He adds the technique of 'forced relationships'; after a list of ideas for solving a problem has been formed, each of the ideas is artificially related to others on the list in order to force new combinations.

The importance of evaluation is stressed by Parnes, and in his brainstorming courses he says "... students are taught to develop the longest possible list of criteria by which to evaluate their tentative solutions."

The 'Buzz group' technique has been mentioned previously. This is a method of involving large groups in brainstorming, by breaking them into smaller groups of six. Each group of six is then given six minutes to reach conclusions regarding questions posed to the large group. A study involving this technique was done by Mason (1962) and reported as effective.

Rapp (1967) gives eight conditions designed to stimulate individual and group creativity. Brainstorming is likely to be more effective if these conditions are met:

1. Preparation - Pre-thinking of experience.
2. Mood or posture - right Mental and Physical attitudes
3. Open mindedness
4. Receptivity - Awareness
5. Enthusiasm - Joy of Creating
6. Stimulation - mental and emotional excitement
7. Concentration - Creating and learning are the hardest work
8. Expression - Develop skill and craft for best expression of ideas

Though Rapp particularly had brainstorming in mind, these conditions are applicable to many creative situations.

Moore (1962) was concerned with the evaluation of ideas that were produced by brainstorming methods. As far more ideas were produced this increased the problems of choosing and using solutions.

As Moore points out "The fun of creativity is replaced by the difficult work of decision making."

He gives various methods of making choices, toss-of-coin, check lists, highest rank, compromise etc., but perhaps the most useful suggestion is that the 'brainstorming' technique could also be used to select the best solution.

He also feels that the same group that came up with the original ideas should also evaluate them.

Moore proposes a 'ranking' system based on "Loose concepts of a mixture of time and money." The ideas should be categorised, initially, as follows:

1. Simple ideas - need little expenditure or time.
11. Hard ideas - bit more expenditure or time.
111. Difficult ideas - most expenditure or time.

The list should be gone through and each solution given a numeral according to the above table. This makes for easier evaluation.

### 'Blocks' to Brainstorming

A number of researchers have found 'blocks' that inhibit the creative thinking processes.

Clark (1958) has mentioned six factors that might prevent self-expression in groups:

1. Early training has not encouraged discussion,
2. Physical Environment
3. Little or no preparation for discussion
4. Domination by others
5. Fear of ridicule
6. General feeling of inferiority

Mathews (1962) has examined the brainstorming process in terms of 'blocks': he used questions concerning the validity of the brainstorming process. The type of question and the answers he found for each 'block' are summarized as follows:

1. Thinking habits built up over years are not changed in a few hours? Mathews found that there was a change of attitude using brainstorming techniques.
2. Techniques should be tested rigorously before being used generally? He found that brainstorming had been tested since 1939.
3. Is it the technique or the personality of the person advocating it? No evidence was found one way or the other, but this is no reason for not using the technique.
4. Even if brainstorming is an effective technique; is it the best? Mathews does not think that brainstorming, in order to be useable, has to be compared to every other technique.
5. Is brainstorming a 'cult'? As it has been presented "... in a very enthusiastic, very strong, vigorous fashion ... as a productive, very potent tool." he thinks that the charge of 'cultism' is warranted.
6. Isn't one of the aims and objectives of most educational programmes 'developing the imagination'? Do we have to bring together a group of graduates "... to try to do in a couple of days something that we

have apparently failed, to a large extent, to do in our earlier education? ... And, unfortunately, the truth of the matter is that I think we have."

Arnold (1962b) gives a list of seven problems encountered in creative thinking sessions:

1. Guilt, 2. Inhibition, 3. Fatigue, 4. Licence (must be given this), 5. Problem statement (do not use technical terms), 6. Choice of the Director, and 7. Choice of groups (avoid specialized introverted group with limited response.)

#### Criticisms of 'Brainstorming'

A number of criticisms have been made concerning the brainstorming methods of increasing creativity.

Tyson (1966) reports a study and criticisms made by Taylor (1957) who suggested that brainstorming inhibited creative problem solving. He compared group solutions with individual solutions and found that the individual solutions were superior. Though he does not state whether the concept of deferred judgement was used by the individuals.

Tyson comments "Perhaps this experimental study produces, ... a qualitatively different performance from regular brainstorming groups, where more frequently the group is larger, members know each other better and the background of the problem is usually given in advance."

Freeman et al (1968) have made two criticisms of brainstorming. "First the experiments described do not evaluate in a controlled way the relative effects of prior training in brainstorming."

Secondly they state "Parnes ... argues that brainstorming procedures are being introduced into various subject-matter fields. There is a need, however, for considerable further detailed investigation into both 'level' and 'type' of education."

These criticisms are justified, though Parnes, Clark and others have pointed out the importance of 'preparation' in brainstorming, and brainstorming has been proved to be successful in a variety of fields.

On the whole there have been few criticisms of the brainstorming technique. There has been a tendency for some advocates, particularly in the fields of

commerce and industry, to be over enthusiastic. This has probably led to the adoption of brainstorming in fields where it is not valid, or to implement the technique without fully understanding the amount of preparation involved.

A number of courses in business, industry, university, college and school, that have used brainstorming methods, have been reviewed by Edwards (1968). The majority of people involved in these courses reported them of value. Among firms who found brainstorming of great value were the Bell Telephone Co. Sylvania Electrical Products Inc., General Telephones, Office Management Association of Chicago and the Industrial Relations Center.

Although many striking results are given for brainstorming, it must be remembered that the fact that people become involved in such 'courses' shows that the firm they are working for is 'interested' in creativity, and expects the personnel they send to be 'more creative'. The interest alone may have some effect in making them more creative; i.e. the well known 'Hawthorne Effect'.

#### SYNECTICS

The method of increasing creativity known as Synectics was popularized by Gordon (1961). It is similar, and is based on, the brainstorming technique.

The word Synectics comes from the Greek 'synecticos'; meaning the joining together of apparently irrelevant elements.

Prince (1968) has stated that Synectics involves two basic activities:

1. Making the familiar strange
2. Making the strange familiar

The challenge is to view the problem in new ways.

The group activity utilising the 'synectics' method was termed Design Synthesis by Gordon. As mentioned, this is similar to a brainstorming session, but, as Arnold (1962b) pointed out, it is a slower process.

In a design synthesis group only the 'chairman' knows the actual problem.

He initiates the discussion by outlining the general 'area' "...e.g. he might ask for ideas on 'storing things' when the particular problem is car parking." As the session progresses he begins to 'limit' area. The method combines the narrowing of the problem, i.e. from the 'steam shovel' to the 'spade'; this, though slower than brainstorming, ensures that possibilities, though remote, strange, etc., from other fields may offer interesting and original synthesis,

#### OTHER METHODS FOR INCREASING CREATIVITY

There are a few techniques that are related to process factors, though perhaps not directly.

The concept of 'lateral thinking' devised by Bono has been implemented as a technique, revealed in such books as 'The Five Day Course in Thinking' (1967). This method is also concerned to make people think about a problem from different angles. As he puts it "The way new ideas come about or fail to come about may have made all the difference. It soon becomes obvious that you cannot dig a hole in a different place by digging the same hole deeper. ...The difference between vertical and lateral thinking is a fundamental one."

The 'Five Day Course', for example, attempts to improve lateral thinking ability. He covers three types of thinking - Insight, Sequential, and Strategic - using problems concerned with bottles, knives and blocks, and the 'L' game, to achieve this end.

The use of 'Bionics' (1968) as an aid to developing novel creations, has been successful. Bionics is basically "the study of the structure, mechanisms, and function of plants and animals to gain design information for analogous man-made systems." Though this technique, as a deliberate method, may be new, there is no doubt that many of mans' creations have stemmed from the study of nature.

Two other processes that have been mentioned are 'daydreaming' and 'doodling'. Though it is possible that exactly the same process is involved in each case, the actual process is visible in the case of doodling, whether

in written or drawn form, but not in the case of daydreaming. It is possible, one supposes, that daydreaming could be 'spoken and taped'; but even here it may not be easy as imagery that is not capable of being verbalized may form much of the daydreaming.

There is too much 'serendipity' involved in such processes, however, for them to be developed as a deliberate, controlled, process for developing creative thinking abilities.

A comprehensive list of Methods and Programmes for stimulating creativity has been formed by Parnes (1968). Although he does not describe the twenty-seven methods in detail, the list does reveal the interest and diversity in attempts to increase creativity.

Mention has already been made that Kneller (1965) would prefer to modify the curriculum to "...draw upon the creative potential in all the subject matter we treat."

Cropley (1967) has a similar view though differently expressed when he states "Attempts to teach creativity formally as a subject in the school curriculum are unlikely to meet with much success. "

#### More Specific Approaches

The elicitation of creative thinking has also been attempted by researchers whose main interest is in the field of behavioural psychology. Such concepts as that expressed by Ray (1967) "... original thinking ... is operant behaviour, and its frequency can be increased by reinforcement." are at the other extreme to those of the analytic researchers, such as Ghiselin or Kneller, mentioned previously.

As an example of an operant approach the work of Houston and Mednick (1963) may be considered. These researchers studied the "Reinforcing properties of associative novelty for creative subjects." They were concerned with a group of high creatives and a group of low creatives, selected by a



previous test (RAT) and these groups were further divided into control and experimental groups. Subjects in both groups were shown a set of cards on which were two words (a noun and a non-noun). The subject chose one of the words and obtained a 'response' from the experimenter. The usual type of association was given, for nouns and non-nouns, to the control group; but novel responses' were given to noun choices in the experimental group, thus reinforcing their liking for 'novelty'. The high creatives in the experimental group did significantly increase their scores in their choice of nouns. No difference was found in the control group.

This supported Houston and Mednick's original hypothesis.

Finally, a similar study by Maltzman et al (1960), using verbal stimuli to reinforce uncommon responses to words in a list, in an attempt to increase originality, concluded "... the standard experimental training procedure of repeatedly evoking different responses to the same stimuli.."was most successful. They further concluded that the results "... lend some support to the hypothesis that originality is a learned behaviour and varies as a function of the same antecedent conditions as other forms of operant behaviour."

Parnes (1968), in his list of methods for increasing creative ability, mentions some attempts at increasing creativity using Programmed Instruction, and, of course, Linear Programmes were based on learning theory precepts such as Stimulus-Response and Reinforcement. The use of Programmed Instruction for increasing creativity will be considered in the next section of the review of literature.

## SUMMARY

The review of methods for increasing creativity has revealed that attempts have been made to increase creativity by the use of environmental influences and by methods to stimulate actual creative thinking processes.

Environmental influences have included 'prescriptions' for personal development, such as those proposed by Arnold, and suggestions for developing educationally favourable environments, such as those suggested by Torrance, Kneller, Hudson and Strasser. The use of 'trigger symbols' as a stimulus has been considered by Brown.

Methods for increasing creativity in the visual arts have been suggested by Hausman, Montgomery, and Rogers. Useful studies to encourage divergent art production and spontaneity have been done by Lowenfield and Burkhart.

Attempts to increase the effectiveness of creative thinking processes, e.g. fluency, flexibility, and originality, by stimulating the factors of association, combination, building etc. have resulted in techniques of deferred judgement, e.g. brainstorming, synetics, red light/green light, buzz groups, lateral thinking and doodling.

The effectiveness of some of these methods has been tested and they have proved useful in a number of situations in commerce, industry and education, though the criticisms made must evoke some reservations.

The use of methods for increasing originality by the use of operant conditioning and reinforcement have been investigated by such researchers as Houston and Mednick, and Maltzman et al.

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## SECTION TWO: PROGRAMMED INSTRUCTION

One definition of a 'programme' is 'a list of things to be done'; and a definition of 'instruction' as 'the imparting of knowledge, or training'. Thus, programmes, such as the 'list of things to be done' when making the Ark (Genesis: Chapter VI), are not new: nor is the process of instruction - stone-age man must have instructed the next generation in the art of making arrows.

It is only in the present century, however, that the concepts of 'programming' and 'instruction' have been linked to provide a unified method of training in education, industry, the services etc.. This development has been due to the integration of ideas from a variety of fields - psychology, education, industry, etc. - and from theoretical and practical bases.

It is not proposed to review the early stages of this development in detail - they are well known now - but some brief notes concerning the early 'Classical' Programmed Learning stage are necessary, however, as more recent developments in Programmed Instruction are reviewed in the light of the earlier concepts.

The work of Pressey (1926: 1932), involving 'teaching machines', and Skinner (1954:1960:1961), devising a method of learning based on operant conditioning and reinforcement theory, played an important part in the development of Programmed Learning.

Skinner based 'linear programming' upon five main principles:

1. An orderly sequence of subject material (the same for all learners)
2. Small Steps, or 'frames', presenting a stimulus
3. An Active Overt Response
4. Immediate Knowledge of right or wrong response
5. Self Pacing (the individual learner works at his 'own rate')

Crowder (1960) based 'intrinsic' (branching) programming on a different concept. He pointed out that Skinner's programming methods were based on theories developed from animal training: Crowder's programmes were based on the Pupil/Teacher interaction in a 'tutorial' situation. Crowder (1964) stated "...while the linear programmer is exploiting a particular theory, the

intrinsic programmer is exploiting a particular technique." The 'scrambled' text-books, and programmes for 'multiple choice of answer' machines, based on Crowder's ideas are well known, and have been adopted in many fields of training.

Criticisms of these concepts have been made by such researchers as Mager (1964 : 1968). Mager's main criticism was concerned with the programmer's right to decide on the orderly sequence for the presentation of the material. Mager (1964) considered that the sequence should be based on "...learner generated sequences."

One important feature of Mager's researches was the finding that learners preferred "...moving from a 'simple whole' to a more 'complex whole', or from the general to the specific," whereas instructors tended to move from a 'simple specific' to a 'complex whole'.

The work of Gilbert (1960:1962), in the field of 'mathematics', was also an influence in programmed learning. He criticized the role of the 'teaching machine', though his 'prescription' for 'mastery of the subject by the student' was based on 'stimulus-response' concepts similar to those held by Skinner.

Basically Gilbert's work involved constructing programmes by utilizing analyses of the actual interaction between the expert teacher and the learner. Such ideas led to further developments in programming, e.g. 'task analysis'. Some of Gilbert's practical ideas in programme construction are well known and have been used often, particularly the 'retrogressive approach to chain sequences' where, in an operation that involved a 'chain action', the last action in the chain is taught first.

The main section of the Review of Literature concerned with Programmed Instruction is divided into two parts: Part A is concerned with briefly reviewing developing concepts in programming, and Part B with programmed methods for increasing 'creativity'.

## PART A: Developing Concepts in Programmed Instruction

The emphasis has now moved from Programmed 'Learning' - where the learner and learning theory was the focus of programming - to Programmed 'Instruction' - where the instructional process is the centre of interest.

The criticisms of Programmed Learning made by Gilbert and Mager have been mentioned earlier. Since the early days of programmed learning most of the principles upon which it was based have been criticised.

The review of developing concepts is discussed in seven parts; five of the parts are based on Skinner's principles, and the remaining two are headed 'Evaluation', which soon became a feature of programmed learning, and 'Other Developments'.

Skinner's principles are examined in the reverse order, compared with usual discussion, however. As much of the recent development has been concerned with 'sequencing' it was considered convenient to place this last, next to 'Evaluation'.

The seven headings are:

1. Self Pacing.
2. Immediate Knowledge of Results.
3. Active Overt Response
4. Small Steps
5. Logical Sequence of Subject Material
6. Evaluation
7. Other Developments

### 1. Self Pacing

This basic principle involves two concepts: (i) The individual works through a programme at the 'pace' that he chooses. (ii) A programme is intended for the 'individual' learner. Both concepts have been criticised.

(i) Individual works at 'own pace'.

This concept has been criticised on several grounds. It is possible that the pace an individual chooses may not be his 'optimal' pace. A number of studies involving 'controlled' pacing have been done in this area.

Pacing may be deliberately controlled by machines - e.g. Pask (1958:1960) - or may be subject to administrative control; e.g. as might be the case in

the school 'class' situation where the time factor or the teacher may act as a control, even if no deliberate control of pacing is intended. Briggs et al reported that there was no significant difference between the test scores of subjects who worked at their own pace and those of subjects who were subjected to controlled pacing. The majority of studies in this area have supported this finding. A number of researchers, however, would agree with Fry (1963) that "...any pace that lends to a higher error rate is undesirable".

A slightly different emphasis on self pacing is given by Kay et al (1968) who said "Self-Pacing means that - A student will be able to go on to fresh material as soon as he has understood the previous teaching, but not before." This is an ideal but not easy to achieve. It is possible, with a linear programme, for a learner to 'skim through it' without understanding; this may not be the case with intrinsic programmes, where a 'wrong' response leads to a 'remedial' section. Crowder (1964) has pointed out that linear and intrinsic programming are self pacing in different degrees.

(ii) Programmes are intended for the 'individual' learner

This was a basic concept in early programming. One reason that self pacing was questioned was so that 'groups' could be taught by programmed instructional methods. Key et al (1968), in a study involving a group paced at a rate achieved by the quickest individual who had used the same programme, reported that, comparing 'group' and 'individual' methods, "...their final test scores were identical." and "...every student expressed a preference for the clock-paced system over the free-paced use of programmed books..." Studies reported by Keislar & McNeil (1962) and Feldhausen & Birt (1962) have indicated similar findings.

Research involving 'pairs' and 'small groups' has also reported that they do equally as well as individuals. Work in the area of groups versus individuals has been reviewed by Hartley (1966 : 1968 ).

It is apparent that concepts of 'self-pacing' and 'individual instruction' are no longer as valid as they were once considered, although, of course,

they are not without value.

## 2. Immediate Knowledge of Results

There has probably been more argument concerning this principle than any other, and the controversy has not ceased. Most differences are concerned with the concept of Immediate Knowledge of Results (KR) as 'reinforcement' or 'motivation'. Recent research developments have placed the emphasis on KR as 'information' or 'feedback'.

The review of literature in this area is considered under the headings:

(i) KR as Motivation, and (ii) KR as Feedback.

(i) KR as Motivation.

The early interpretation of KR as 'reinforcement' in operant conditioning terms, has now fallen from favour in educational and training fields. Lumsdaine (1964) said "... I question very seriously whether theories placing primacy on the manipulation of reinforcement provide an adequate or even a very useful theoretical model for the development of instruction in many academic or technical subject matters."

The concept of KR as 'motivation' or 'incentive' is considered to play a part in Programmed Instruction, though this is to some extent allied to the concept of 'feedback': indeed Annett (1969) has stated that "Motivation could be described as feedback in action."

In early programming the 'novelty' of the 'format' or the 'machines' used was thought to be motivating, and this was probably true - the 'unusual' is normally interesting.

KR as an 'incentive' feature is a concept that is still controversial; much of the argument is with the Skinnerian idea that the more often a student makes a correct response, the greater will be his motivation. This would imply that if the student makes wrong responses 'motivation' weakens; this may be possible, but a number of studies have found that "...some negative reinforcement ... will not hinder a student's learning" as Melarango (1964) stated.

As a result of criticisms of KR as reinforcement or incentive the interest in the alternative concept of KR as 'information' or 'feedback' has increased. Annett (1964) has said "... it emerges that the information rather than the motivation content is important to learning..." For further analysis of the conflict the reader is referred to as Smith and Smith (1966) and Annett (1969).

(ii) KR as Feedback.

Smith and Smith (1966) have stated "...feedback is a more useful concept in understanding learning than either confirmation or reinforcement for it describes the differential process by means of which the individual compares his performance with a prescribed pattern. "Annett (1969) stated "The general feedback concept puts KR ... in its proper context. What is normally called KR involves the manipulation of an external feedback loop relating to certain aspects of a subject's performance"; further he comments "The so called incentive function of KR seems to involve both providing the subject with a performance standard to aim for and information necessary for corrective action."

These statements summarize the role of KR in Programmed Instruction which is accepted for the purpose of the present study; KR provides feedback in terms of information concerning the standard desired.

Other aspects of KR have been the subject of controversy; e.g. the frequency, delay, or omission of KR. Varying results were found in studies involving these factors. Moore & Smith (1964) found that immediate KR was not necessary to effective learning programmes. They stated "... it is possible to conclude that the effectiveness of self instructional materials ... may be attributable to the format of the material rather than to the use of a technique for providing immediate KR." Annett (1964) stated "Making a response and getting knowledge of results is only one way in which the information necessary to carry out some desired response can be acquired and it is not always the most efficient."



Whilst a number of studies have found KR unnecessary, or only of minimum effect, it is undoubtedly has a most important place in Programmed Instruction, as it has in any cybernetic effect in human activity - and this includes most learning situations. In intrinsic programming, not computer or machine controlled, for example, KR is often essential as the path the learner follows is dependent upon it.

### 3. Active Overt Response

Active Overt Response is mandatory in any intrinsic or computer controlled programmed instruction as the presentation of the material is controlled by such responses. In developing other types of programming, however, the concept of overt response has been questioned. The term 'active' is perhaps superfluous, as any 'response', whether overt or covert, is detectable in terms of 'action' of some kind in the human organism.

The controversy has arisen between those who insist that a response should be observable or 'overt' - in terms of actions like writing, pushing buttons, etc. - or purely cognitive or 'covert' - in terms of actions like reading, memorizing, problem solving etc. Skinner (1964) has stated "... the action demanded of the student is not some sort of mental association of contiguous experience." This concept obviously demands 'overt' response, and was an essential factor in early linear programming.

Studies that explored the difference in effectiveness between overt and covert response are reported by Fry (1963)—Holland (1960), Evans et al (1959), Roe (1960), and Goldbeck (1960) and Evans (1960). These studies found little difference between the results obtained using covert and overt response, but usually found that covert response led to quicker learning.

Coulson (1962) stated "In general we have found no evidence to support the widely held belief that programmes must consist of very easy frames and must require overt, written responses."

The advisability of asking questions in order to elicit a response has been questioned in studies performed by McNeil & Keislar (1964) and Wright (1967).

Cummings and Goldstein (1962) felt that research in the area of overt and covert response was complex and difficult: they commented "One man's overt is frequently another man's covert or multiple choice, while the second man's covert can be found to be another's control." They did however, find overt preferable to covert in certain areas of their study.

Some studies have found overt responses better than covert where children were involved, e.g. Holland (1965), where programmes were long or difficult.

The main question in this area must be 'In what circumstances is an overt response necessary?' The answer must depend on the material to be learned and the type of Programmed Instruction involved. If overt responding is not used at some stage in the programme, however, then one form of 'feedback' to the programmer - essential in developing and evaluating a programme - is not available.

#### 4. Small Steps

The concept of numerous small steps, or 'frames' - considered essential in early linear programmes - has been questioned on a number of issues. The findings concerning 'linear v branching'KR, 'overt v covert response' - mentioned above - have influenced developing concepts in Programmed Instruction concerning frames.

The concentrated effort needed to work through a long linear programme was found to promote a 'pall effect'. This was noticed by several researchers e.g. Rigney & Fry (1961)

The literature concerning 'frame' construction is extensive, often complex, and sometimes controversial. It is not proposed to review this in detail; most of the concepts and terminology are well known. Terminology

concerning 'frames' that prompt, lead in, cue, fade, force, skip, review, or discriminate etc. have been used by many programmers. Similarly, a number of systems for writing frames have been devised and used: e.g. the 'Ruleg' system (Honne & Glaser, 1960) leading to the 'Matrix' system (Evans et al 1960).

The reader is referred to the following literature for detailed information concerning frames and frame writing: Skinner & Holland (1959), Smith (1959), Meyer (1960), and Thomas et al (1963).

Numerous studies have queried the 'size' of steps, and the degree of 'difficulty' for the learner. The results were found to vary in accordance with a number of factors; the most important of which were: age, ability and knowledge of the subjects, the subject material involved, and the technique of programmed instruction used. The use of small steps, in linear programming, was found effective and resulted in less errors (Coulson and Silberman, 1959). Garner (1966) considered "Programming Techniques have moved away from strictly linear sequences composed of small steps (which suggest a concern with subject matter) toward multiple paths containing optimized step sizes (suggesting a concern with student needs)."

Rowntree (1966) considered that, to avoid the loss of interest due to the great numbers of small, simple units of information, the material should be 'challenging'. Kay et al (1968) have said "A frame is a unit of presentation which makes you think and act. A good frame is a presentation which makes you do something which will help you to learn."

The conclusions reached in considering the concepts regarding 'frames' are:

1. A frame should be of 'optimum' size for the learner and the material involved.
2. The material should be 'challenging' to the learner.
3. A frame should elicit a response, which may be overt or covert.
4. A programme may involve 'frames' of many different types.

To a large extent the form a frame may take in present developments in

Programmed Instruction will depend on the approach to the 'sequencing' of the material.

### 5. Appropriate Sequence of Subject Material

This is probably the most important area in the developing concepts in programmed instruction. There has been much research in this field.

The early queries, regarding the question 'What is an orderly sequence?', led to a number of approaches to 'sequencing' methods appropriate to programmed instruction.

Smith and Smith (1966), when commenting on early studies in the field, stated that "...the absolute order of items may not be as important as some linear programmers have assumed." Whilst this may be true to some degree, there is still need for research into the best types of sequencing.

Sequencing in early days, based on Skinnerean theory, was 'programmer' based. Magner (1964), as mentioned earlier, was concerned that sequences should be 'learner' based.

Gilbert, also mentioned earlier, based his ideas on theories that were similar to those of Skinner, although his 'mathetics' concepts involved learner, expert, and programmer. The mathetics approach has been taken to a high state of development by researchers such as Mechner (1967). Mathetics was an attempt to combine 'expert' based and 'Learner' based sequencing. The approach can be summarized as follows:

The 'learner' has the 'mastery of the subject' in view at the outset; this is assumed to be 'motivational' in that he sees that each step taken is a step nearer to mastery.

The stages that are taken to find the best sequence for such a programme are:

1. Analysis of the task as performed by the 'master'.
2. Analysis of methods the learner must use to achieve mastery.
  - (a) by observing the way the learner learns from the expert.
  - (b) by finding if this is the best way for the learner to achieve mastery

It is obvious that this is no easy way to find a 'prescription' for ideal sequence, but the mathetics concepts are valuable and should be kept in mind.

The idea of keeping the master performance in view of the learner has been used in 'chain sequences' by adopting 'retrogressive' sequences: i.e. the last action is performed first, then the next to last, and etc. - as in the classic example of learning to tie a shoe lace by first learning to 'pull the bow tight'. This method has not been proved to be any more effective than other chain sequence methods, however.

More recent developments in sequencing have been based on analysis of the subject material. This approach was made by several researchers, principally Gagné (1962) who said, regarding the problem of improving training "... I should not look for much help from the well known principles like reinforcement, distribution of practice, response familiarity, and so on. I should look instead at the technique of task analysis, and at the principles of component task achievement, intratask transfer, and the sequencing of subtask learning to find those ideas of greatest usefulness in the design of effective training"

Fry (1963) stated "The objectives must be stated in detail. Exactly what must the student learn or be able to do when the desired result is achieved." Task analysis is basically concerned with the achievement of the objectives, which must be clear and unambiguous. A learner must also attain, or have attained, mastery of 'subtasks' necessary to achieve the objectives; Gagne (1965) describes the 'hierarchy of tasks' involved in this area. There are three main factors involved in this approach to sequencing:

1. The Target Population.
2. The Objectives.
3. Task Analysis.

Much research has been done in the area of task analysis. Some of the research done in the area of 'frame construction' e.g. the 'ruleg' and 'matrix' systems, is also relevant to task analysis in the sequencing stages.

A comprehensive exposition of task analysis and its development has been given by Davies (1971): Objectives, Prescriptions, Hierarchy of Tasks,

Analyses of Systems, etc. are described in detail. Davies has done much valuable work in developing the 'matrix' system, and stressing the importance of 'logical trees' - or 'decision trees'. He states "...the logical tree is a simple functional flow chart, on which information is presented as a sequence depicting the structure of complex material." Davies, (1966). Logical trees are also useful 'on the job' aids in programmed instruction, and Evans (1966) found that "pupils do not become dependent on the chart, but discard it as soon as they are proficient in solving the class of problems."

In spite of all the research that has been done to discover methods for arriving at the ideal 'appropriate sequence' it is difficult to find any one approach that is better than another in all cases. It is possible that there is no 'perfect' approach. The 'best' sequence is probably that obtained by a combination of analysis, attitudes, hunches, experiments and common-sense; dependent upon 'what' is to be learned, and by 'whom'.

## 6. Evaluation

The importance of evaluation as a factor in programmed instruction cannot be overemphasized. To the programmer, evaluation is, as Hartley (1963) states, an 'internal' factor; the programmer must achieve the objectives within the set limits. It is obvious today that evaluation is a continuous process during the construction of a programme. Depending upon the length and difficulty of the programme; each section must be tested and revised until it works.

Evaluation takes place in two main areas:

1. Evaluation during the programme development (internal).
2. Evaluation of the programme in the 'field' situation for which it is intended (external)

With a few exceptions, the literature on programmed instruction has little to say concerning evaluation during the construction of programmes; beyond stating that it is necessary to revise them till they work. This, internal evaluation is usually left to the devices of the programmer; much depends on the type of programme, subject material, and methods involved.

For evaluation in the field the same conditions must apply to testing

programmes as for testing the effectiveness of any instructional process. Certain main factors must be taken into account when evaluating. The tester must know, as Hartley (1963) states "...the prerequisite knowledge required by the pupils, the type and ability of the pupils it is intended for, what the programme teaches, what success it has had so far, and under what conditions the previous testing was carried out." Although these remarks are concerned with testing programmes not constructed by the tester, the basic factors are essential for effective evaluation.

The use of pre and post-tests to establish whether or not a programme has achieved its objectives is the evaluative procedure normally followed in the field. The choice or construction of the 'criterion measures' used in such evaluation is, however, critical. A test can only reveal what it is designed to reveal; and it is possible that a programme may have effects other than those intended, even though evaluation shows it to be successful in terms of objectives attained - as measured by criterion tests.

A study by Rothkopf (1964) showed that attempts to evaluate a programme by simple inspection were useless; in fact he found a negative correlation (-.75) between 'ratings' and the 'tested' effectiveness of a programme.

Much of the early evaluation, particularly in linear programmes, was concerned with the 'error rate' made by learners when working through the programme. The fewer the errors, it was argued, the better the programme. Intrinsic programming, however, does make use of errors, and Stolurow (1964a) has stated "...errors can be useful in the development of the intellectual capability of the human learner. From this point of view errors can be employed to build knowledge and skill." Whilst this may be true, it is not desirable that the learner should make so many errors that he is positively discouraged. The learner should not make many errors in a well constructed programme, but he should not find the programme over simple. The final value of an evaluated programme is that it effectively teaches material that is worth learning. It is quite possible, as Markle (1962) has mentioned, to construct effective, evaluated programmes that teach worthless material.

## 7. Other Developments

To a certain extent some recent developments in programmed instruction appear to negate the concepts considered essential to programmed learning in the early days.

Pressey (1964), an early innovator in the programmed learning field, has attacked classical concepts of programming and recommended 'adjunctive' programming. This is based on the fact that programmes, e.g. linear, could not be viewed as a 'whole'. He stated "...that for skimming for main ideas, for review... the programmed book is almost impossible." He further states "... they are unsatisfactory, because most important material to be learned has structure, which programming destroys..."

Such criticisms have led to attempts to overcome this structure deficiency in programming. The use of decision trees, flow charts, etc. reveal attempts to meet such criticism; and much work in structural communication is being attempted today.

The use of a variety of technical aids, films, charts, books, TV etc. in conjunction with programmed materials is becoming much more common, particularly when associated with Computer Assisted Instruction. Such programming concepts tend to lead to a more comprehensive 'systems' approach to instruction however, and thus goes beyond the scope of this study and this review. A concept such as the 'structural communication' developed by Bennett et al (1967), where the "aim is to evoke understanding" is one of the recent developments in this area.

Programmed Instruction now appears to have reached a state where the 'mystique' of the early 'priesthood' has been challenged on every principle and the search for 'truth' and 'effectiveness' in instructional methods is leading into diverse and ever widening fields.



## PART B: Using Programmed Instruction for Increasing Creativity.

Stolurrow (1962) found that "Mental age seems to be less related to post-programme performance than to performance on originality tests. The findings suggest that as incidental learning, strategies of thinking may be teachable by programmed instructional techniques." As has been noted in the review earlier, a number of methods for increasing creativity have been tried, but there are very few that have involved using programmed instructional methods for doing so.

The idea of using programming for increasing creativity has been criticised, mainly on the grounds that as programmed instruction questions demand a 'correct' response it is impossible to develop divergent or original thinking using such methods. The assumption is that programming can only cater for 'convergent' thinking. The author, and a number of others, do not take this point of view.

Programmes for creative performance in the visual arts are also few in number; those that exist are more in the nature of a 'blueprint' than a developed programme. The field is growing in this area however, and more may be reported in the literature soon.

Crutchfield (1967) has noted some of the major issues where programmed instruction appears to be opposed to the development of creative thinking. He states:

"Certainly it would seem likely that programmed instruction, if used in a rigidly orthodox fashion, might be potentially detrimental to the very creative qualities that we seek to enhance. For one thing, programmed instruction may tend to produce an excessive homogeneity among the thought processes of the students commonly trained. ...Such homogenization tends to preclude the diversity in thought processes essential to the promotion of creativity, both in the individual and in the group. For another thing, the 'successful' programme, by virtue of the very effortless ease of learning that it enables, may fail sufficiently to arouse and engage the individual's own activity of searching and striving after meaning, which is an essential part of creative growth...Moreover a 'successful' programme through which the individual is marched in an authoritative logical lockstep, may tend to inhibit the questioning and skeptical attitude that is often conducive to creativity... Finally one of the essentials of creativity would appear to be the ability temporarily to tolerate ambiguity, complexity and lack of closure while progressing toward a solution of the problem. Yet a cardinal aim of programmed instruction is to attain the utmost clarity, precision and definiteness at each step."

This would appear to indicate that increasing creativity by the use of programmed instruction is not possible; yet many of the principles upon which those criticisms are based were themselves questioned, as was noted in the previous part. Crutchfield has further comment in this area;

"But through more flexible forms of programming we can avoid some of these detrimental aspects and can capitalize upon its positive potential for creativity in training. Its features of self administration and self pacing, etc. permit the individual considerable latitude in independent regulation of his own preferred rate of work and tempo of thinking on the materials. In order to challenge the student, the size of the step can be made substantially larger than it is in orthodox programming, where the monotony of repeated small steps may destroy interest. Thus, a typical frame, or page, may contain much more complex material, require more time for reflection, and call for multiform rather than single responses."

Crutchfield also refers to the difficulty of providing feedback where 'open ended' questions may elicit a variety of answers. This can be overcome, as Crutchfield says "An effective feedback to his responses might be to give him an illustrative set of diverse and unusual ideas that have been, or could have been, produced by the others."

As has been noted earlier, many of the criticisms that would preclude programming for creativity are no longer valid; e.g. many programmes, not concerned with creativity, adopt large step sizes, multiform answers etc. The Productive Thinking Programme

One of the best known of the programmed methods for increasing creativity is the Productive Thinking Program developed by Covington, Crutchfield & Davies (1967). This consists of 16 work books and a teacher's guide. The work books are 'detective stories' that implement factors in the creative thinking process. The children in the stories use creative thinking techniques in their problem solving efforts.

There are 'key guides' to thinking in some of the lessons. These are given in the appendix to the teacher's guide:

"Index of the Guides for Good Thinking:

1. Guides that are helpful when you start work on a problem.  
Get facts well in mind.  
Decide what problem to work on first.  
Be planful in the way that you work.  
Don't jump to conclusions - keep an open mind.

2. Guides for getting ideas.  
Think of many ideas.  
Think of unusual and clever ideas.  
Pick out each main person and object in the problem.  
Use the 'idea tree' (of main and particular ideas).  
Almost anything can remind you of an idea.
3. Guides for using the facts.  
Check ideas against the facts.  
Pay attention to puzzling facts.  
Try to explain puzzling facts.  
Try to find one idea that explains everything.
4. Guides which help when you're stuck on a problem.  
Review the facts.  
Look at the problem in a new way.  
'Just suppose' - that such and such is the case: how could it have come about?"

One criticism of this programme is that there is a 'correct' answer to each problem. However, the act of finding the solution opens the mind to creative thinking processes, which may be transferred to other creative activity. Crutchfield and Covington (1965) have stated "The training of creativity in the individual necessitates both the strengthening of certain cognitive skills which are central to the creative process and the encouragement of certain attitudes and dispositions which favour the use of these skills."

The 'skills' and 'abilities' include: generation of many ideas, originality evaluative skill, forming problem in workable terms, transform common into uncommon, see familiar in the strange, sensitive to materials, thinking intuitively, bring order out of confusion, suspend criticism of ideas, place a high value on creative work, have confidence in own creations, deviate from established ways of thought, withstand conformist pressure, and develop a 'master thinking skill', which they state as "This master thinking skill involves appropriate selecting, timing, balancing, harmonizing, and flexible sequencing in the use of specific skills." They suggest that all the skills should be used at the same time to maximise the transfer to real creative problems at a later date.

Studies to test the effectiveness of the programme have been performed. Covington & Crutchfield (1965) report two studies in which the Productive Thinking Programme was found to be effective. Oulton (1969) reported that,

as a result of using the Productive Thinking Programme, "...the instructed children have demonstrated considerable improvement in their ability to perform such creative functions as generating ideas of high quality, asking relevant questions, making effective use of information, being sensitive to discrepancies or other puzzling aspects of a situation, and achieving solutions to problems. These gains were found across a wide spectrum of ability levels - among low achievers as well as high, among the culturally disadvantaged as well as the advantaged." He also stated that the gains were enduring.

Shackel and Lawrence

Shackel and Lawrence (1969) report an experiment in programmed instruction for creativity. They devised an Auto-instructional Programme comprised of six programmed textbooks, based on Guilford's factors (Fluency - Ideational, Associational, and Expressional, Flexibility, and Originality and Elaboration), to train verbal abilities. The learners involved in the studies were 12 year old children.

Each of the six programmes has three sections:

- Introduction - discussed the nature and importance of creativity ('covert' responses).
- Presentation - instructional content including presentation and 'exercises' based on a variety of training methods: e.g. Supposing, opposites likenesses, humour, re-arrangement, (requiring 'overt' written responses to exercises).
- Conclusion - summary of techniques, ways of remembering, note on 'incubation' in the case of difficult problems ('covert' responses).

Certain features were emphasised throughout the programme, e.g. rejection of premature judgements, encouragement of 'think for yourself', perseverance, and sensitivity to problems.

The study was designed using four groups of subjects; each with a different treatment:

- A was administered an Auto-instructional programme, including exercises
- B was administered Exercises only, drawn from the practice items in the programme.
- C Administered a conventional 'lesson' with exercises, identical where possible to the programme exercises, covering the same material as the programme.
- D was the 'no treatment' control group.

The battery of pre and post tests included the TTCT, a test for 'cognitive factors', and an essay test.

Analysis of Variance revealed that a significant F was found for each of the 'methods', except in the case of the TTCT Figural Fluency and Flexibility. Non-significant results were obtained in the case of the Sex and Interaction (Methods x Sex) factors. All the treatments showed a significant gain compared with the control group, and the programmed instruction method was significantly superior to the other two methods. All groups increased their scores from pre to post tests.

Shackel and Lawrence state "...results suggest that Automated Instruction can also be used to develop figural abilities." and they conclude "...programmed instruction can not only be presented in a way which eliminates its potentially detrimental effects upon creative thinking, but can be directly utilized as a powerful instrument for the exercises and training of such abilities."

#### Torrance and Colleagues

The work of Torrance in the field of increasing creativity is well known, and his work in some areas was reviewed earlier. He, and his colleagues, have developed several self-instructional programmes.

Myers & Torrance's (1964) 'Idea Books' are well known. These 'programmes' together with the TTCT comprise a package for increasing and testing creativity.

The Idea Books consist of four sections and a link from Primary Grades to Seniors. The sections are:

Can you Imagine - 23 units for primary grades	
For those Who Wonder - transitional book: grades 3 - 4	
Invitations to Thinking and Doing	" 4 - 6
Invitations to Speaking and Writing	" 6 - 8
Plots, Puzzles and Plays	" 7 - 8

Myers and Torrance state "Through the Idea Books, pupils become involved with activities requiring them to struggle with ideas and expand their thinking abilities. They are encouraged to be both receptive to and critical of ideas of others, to analyze problems, to elaborate ideas, to explore possibilities, and to see relationships."

Another programme is the Cunnington and Torrance (1965) series of record albums, entitled 'Imagi/Craft'. Most of the 'albums' have a record of two dramatized episodes in the lives of creative persons, a record of related Creative Thinking Exercises, and a Teacher's Guide. The dramatizations are designed to "...familiarize children with the nature of the creative process, the creative person, and the creative achievement. These may be stopped at strategic points for problem solving, guessing the consequences, and consideration of various possibilities."

Whilst there is no programmed text the children are required to respond, and the teacher is involved deeply; indeed the teacher may be considered to be 'processed' as part of the programme.

A number of studies involving the Torrance programmes have reported significant gains ( $p \leq .05$ ) in creative power. Among these are : Torrance (1964a), Torrance and Gupta (1964), Torrance (1965) and Britton (1968)

Purdue Creativity Program

Another programmed attempt to increase creative ability has been devised by Feldhusen et al (1970) This is the Purdue Creativity Program; it has been in use since 1966 in research, and its use has been reported by various researchers.

It is similar to the Torrance programmes in some ways. It consists of " ...twenty eight audio tapes and a set of three or four printed exercises for each tape. The taped programme consists of two parts, a three to four minute presentation designed to teach a principle or idea for improving creative thinking, and an eight to ten minute story about a famous American pioneer. The exercises for each programme consist of printed directions, problem, or questions which were designed to provide practice in originality, flexibility, fluency and elaboration in thinking."

Studies by Bahlke (1967) and Feldhusen, Bahlke & Treffinger (1969) concluded that the programme "...was effective in facilitating the development of some creative abilities." Similar findings were made by Robinson (1969).

Further references to Purdue Creativity Program and its development can be found in Evans et al (1968). and Treffinger and Ripple (1969).

Programmed Instruction and the Visual Arts.

In the field of increasing creativity in the visual arts, there is little in the literature that is relevant.

Quirke (1963: 1965) has developed a programme to develop divergent thinking - although details are not available - and an analysis of visual art work with a view to programming. Her work has been criticised by Lillstrom (1965), who makes several valuable comments. In particular he states "With a more direct approach to manipulating perceptions we may be able to attain ... a language of vision." and further "If we could invent a language that corresponds to the experiences of visual perception, a language that could be used to communicate ... and if we could develop in students an exploratory attitude toward their working materials ... then we should have taught the elements essential to creativity."

Quirke's own approach is through the method of looking at pictures, making a verbal response, followed by handling materials according to instructions and making verbal responses to questions concerning their findings.

#### Conclusions.

Thus, although there have not been very many studies that have attempted to increase creative ability through the use of programmed instructional methods, those that have been developed and tested appear to have met with some degree of success.

From the review of those that have been developed, however, it can be seen that the early 'classic' methods of programming have not been used, nor are likely to be effective, whilst the more recent, flexible forms of auto-instructional methods do offer possibilities for the future development of programmed instruction in creativity.

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## CHAPTER FOUR

### DEVELOPMENT OF HYPOTHESIS

It emerges from the review of the literature that several hypotheses must be developed and tested to find an answer to the problem stated in Chapter Two. I.e. "Can programmed instruction be effective in increasing creative ability: particularly in the visual field?"

Examination of the problem, in the light of the review, indicates that the first necessity is to discover if 'creativity' can be measured. If no effective means of measuring 'creativity' can be found, then an experiment to test the effectiveness of a programme for increasing creativity is not practical.

Thus there are three main problem areas to be considered in the development of hypotheses. These areas are:

1. The search for a suitable instrument, or instruments, for detecting any increase in creative ability: particularly in the visual field.
2. The choice of an existing method of programmed instruction, or development of a method, for increasing creative ability: particularly in the visual field.
3. The design of an experiment to test the effectiveness of the chosen, or developed programme.

Two hypotheses appear from consideration of these three areas:

- A. An instrument, or instruments, can be found that will detect changes in creative ability.
- B. A creativity programme can produce an increase in creative ability.  
The increase can be measured by instruments found effective in testing hypothesis A.

#### Development of Hypothesis A.

The review of literature indicates that several sub-areas, of area 1 listed above, must be considered in developing the hypothesis that test instruments can measure creative ability.



Area 1 can be subdivided, for developing and testing the hypothesis, as follows:-

- (a) Examination and choice of tests of creativity. This sub-area includes tests based on judgements of visual productions, tests of personality, and creativity tests.
- (b) Adoption, adaptation, or development of criteria for judging creative ability in visual productions: with particular reference to art works produced by secondary school children.
- (c) Correlations of scores on chosen tests of creativity with the scores on visual productions rated for creativity. Positive significant correlations will indicate that creativity tests may be used to measure creativity in the visual field. Also involved here is the choice of levels of significance to be adopted when accepting or rejecting the 'Null Hypothesis'.

#### Development of Hypothesis B

The development of the hypothesis that programmed instruction can effect an increase in creative ability, involves areas 2 and 3 listed above. These two areas can also be subdivided, as the review of literature has indicated.

Area 2 The choice, or development, of a programme for increasing creativity involves the following sub-areas:

- (a) Examination of those factors considered important in creative work; including consideration of the creative person, the creative process, and the creative product. A choice of those factors that may be manipulated in order to increase creative ability.
- (b) Examination of methods used in programmed instruction; particularly those methods that may be suitable for developing a programme for increasing creative ability.
- (c) Study of those methods already used in attempts to increase creativity:
  - (i) non-programmed methods and
  - (ii) programmed methods.

Area 3 The adoption or design of an experiment to test the effectiveness of a programme for increasing creativity involves several sub-areas. It is also dependent upon finding suitable means of detecting changes in creative ability, in the test of hypothesis A.

The main sub-areas involved are as follows:

- (a) Examination of 'experimental' methods, involving control and experimental groups, that may be suitable for use, within the practical environmental boundaries, in testing the effectiveness of the creativity programme.
- (b) Study of previous experimental methods used in similar or associated situations.
- (c) Hypothesis Testing: the 'null hypothesis', type one and type two 'errors', and choice of the levels of significance to be used in accepting or rejecting hypotheses.

The above outline shows the areas involved in developing hypotheses that should provide answers to the problem.

The problem, "Can Programmed Instruction be effective in increasing creative ability: particularly in the visual field?", can therefore be attacked by testing Hypotheses A and B.

These two hypotheses may be stated, using the 'null' form of statement as follows:

#### HYPOTHESIS A

"There is no relationship between creativity measures and creativity judgements of visual productions."

#### HYPOTHESIS B

"Following the administration of a creativity programme, there will be no difference between the means of the pre-test and post-test scores on creativity measures of male and female, control and experimental groups".

The testing of Hypothesis B is, of course, dependent upon the rejection of Hypothesis A.

A series of studies are necessary to test these hypotheses:

Part Two of the thesis is concerned with Hypothesis A, i.e. finding or developing measures of creativity.

Part Three of the thesis is concerned with the development and construction of a creativity programme.

Parts Four and Five of the thesis are concerned with the experimental testing of hypothesis B.

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## PART TWO STUDY TO TEST HYPOTHESIS A

### CHAPTER FIVE

#### INTRODUCTION-DESIGN OF THE STUDY: SUBJECTS, TESTS, AND CRITERIA FOR SCORING ART WORKS.

##### INTRODUCTION - DESIGN OF THE STUDY

The purpose of this study was to test Hypothesis A; which, stated in the 'null' form was:

"There is no relationship between 'creativity' measures and 'creativity' judgements of visual productions."

Correlations between scores on 'creativity measures' and scores on art works scored for creativity were examined, at chosen levels of significance, to test the hypothesis.

The subjects, for convenience, were pupils in a secondary school.

The basic requirements for 'creativity' measures were as follows:

They should be (a) easily administered and scored, (b) suitable for testing groups of children, and (c) economic and easily available.

The requirements for the criteria for measuring 'creativity' in art works were as follows:

They should be (a) as objective as possible, (b) capable of yielding a scaled score, and (c) scored as simply and quickly as possible.

The development of the study is given in three sections:

1. The Subjects. 2. Creativity Measures. 3. Criteria for measuring Creativity in Art Works.

##### SECTION 1. THE SUBJECTS

For practical reasons it was necessary to use the pupils of the rural secondary school at which the author taught. Thus the subjects cannot be said to be a random sample from the general secondary school population. There is no evidence, however, to show that these subjects were, as a group, very different from children of this age range in the total secondary school population.

The subjects had a wide range of ability, and their IQ was mainly below the 120 level. As the 'intelligence' factor was not, however, part of the present study it was decided not to include an IQ test in the study.

To a certain extent the subjects were culturally deprived, having no easy access to galleries, theatres, concerts etc. other than school visits, compared with city children. The impact of television, mass media, etc. may, however, render this factor as unimportant.

The subjects were forty-five First Year pupils (approx. 11½ years of age) and forty-one Third Year pupils (approx. 13½ years of age). There were two First Year forms and two Third Year forms. There were males and females in each form (42 males, 44 females; each form approx. half male-half female).

A few subjects were not able to read well; in such cases help was given when it was required.

## SECTION 2. 'CREATIVITY' MEASURES

From the review of literature (Section One; B) it is evident that a number of tests of creativity have been devised. Also a number of other tests, not originally designed to test creativity, have been used. Such tests have usually been used in psychological fields, e.g. the Rorschach Test.

A number of tests that appeared likely to meet the requirements of the study were examined, and in a few cases tried out.

The majority of the tests and measuring instruments were rejected as not meeting the requirements stated previously. In addition, some were rejected as not reliable, too complex, or too subjective in scoring; many also had pronounced verbal bias or no visual creativity content.

Only those tests that had been validated in previous research, or had reached a high standard of development, were considered.

The tests and measures were considered in the three areas reviewed in the literature: (1) Visual Art Judgements (2) Personality Tests (3) Tests of Creativity.

## 1. VISUAL ART JUDGEMENTS

The 'Goodenough' test was not considered reliable, though it is easy to administer and score; it is also basically an IQ test.

The 'Meier Art Judgement Test', the Graves Design Judgement Test', and the 'Barron-Welsh Art Scale' were rejected as unsuitable for children. The Meier and the Graves were tested with a few children, but were only found effective with intelligent children who were motivated in the field of the creative visual arts. These tests involve making a choice between two pictures. A number of children became bored with this and ceased to think about their choice. They finished the test by making random choices, which invalidated the results. The Graves and the Meier were easily available but would have been too expensive for large group purposes. The Barron-Welsh did not appear to be available at the time of the early survey.

The 'Horn Aptitude Test' was rejected as it was too subjective and rather difficult to score in comparison with others.

As was expected, the 'Keiselbach Test of Aesthetic Discrimination' was a test of aesthetics and not creativity, and was rejected on that count. No test of visual art judgement was therefore selected.

## 2. PERSONALITY TESTS

The literature showed that many psychological tests of personality have been used in 'creativity' research. Most of the tests that have been so used did not meet the requirements of the present study.

The Rorschach Test, The Thematic Apperception Test, and the Study of Values were too subjective, not reliable, or were too complex. Also, they were not suitable for children in the classroom situation.

The Minnesota Multiphasic Personality Inventory, and the related California Psychological Inventory were not suitable for younger children.

The MMPI was also too long, and the interpretation of the profiles was rather subjective as Anastasi (1966) had pointed out.

The 'interest blanks' of various types, e.g. the Strong Vocational Interest Blank, The Gough Adjective Check List, and other 'attitude scales' such as the Myers-Briggs Type Indicator were not suitable for the younger child, were too verbal and, as with the Art Judgement tests could be answered randomly.

The majority of psychological inventories can be completed by making random choices; but if the test is sufficiently motivating to the child, then it is more likely that valid answers will be given as interest is maintained throughout.

A test designed for children, that can be used with groups, that is easily administered and scored, and that is economic and readily available, is that devised by Cattell (1965) and his associates. This is the High School Personality Questionnaire (HSPQ) and related test for younger children, the Children's Personality Questionnaire (CPQ). Though this test is mainly verbal, and relies on choice, it does include a second order factor score for 'creativity', and profile for the creative individual. The questions are also more likely to hold the child's interest for the duration of the test. This was found in a trial, even where poor readers had to be assisted.

The HSPQ/CPQ had been used in a number of previous studies, as has been shown in the review of literature, though Holland (1962) had found that the validity of personality inventories is generally low.

Creative persons are often said to be introverts. The HSPQ/CPQ includes a measure of Exvia/Invia; this could also be included in the present study as an incidental feature to test the validity of this widely held belief. Cross, Cattell and Butcher (1967) had found that some artists were extraverts, so that there is still controversy in this area.

The HSPQ/CPQ was therefore chosen as a possible test of 'creativity' in the area of personality.

### 3. TESTS OF CREATIVITY

As the literature has revealed there are few tests, compared with psychological tests, designed specifically to test for 'creativity'.

The Remote Associates Test (RAT), Mednick (1962), was rejected as being more a test of 'conventional verbal skills', as Cropley (1967) put it.

The Luchins Water Jar Test did not meet the requirements and was not a group test.

The Wallach and Kogan Tests were rejected as unsuitable for group administration (although the motives behind the elimination of the 'time' factor and 'test' situation were appreciated)

The majority of creativity measures have been based on the factors Fluency, Flexibility, and Originality, with the addition in many cases of the factor Elaboration. Guilford (1950) and his associates have developed tests based on these factors, and development is continuing.

The Minnesota Tests of Creative Thinking (MTCT) have been developed to a high degree. They include verbal and visual measures and a high degree of objectivity has been achieved in scoring methods, though it cannot be said that scoring is very simple.

Yamamoto (1964) devised comprehensive scoring methods for the MTCT. The Figural Battery of the MTCT was tested using Yamamoto's scoring procedures in a study immediately preceeding the present study, (Williams R.E. 1968) and the results led to the rejection of the 'null' hypothesis' (similar to the present hypothesis) at a number of points. The results were not entirely satisfactory however, so a more recent development of the Minnesota based tests was examined.



Torrance, who was involved with the development of the Minnesota tests, brought out his own 'Torrance Tests of Creative Thinking' in 1966, with revisions to the scoring in 1967 and 1968. The scoring for these tests appeared even more objective, and simpler than those for the MTCT. The Torrance Tests of Creative Thinking(TTCT) were readily available in two parallel forms, and also contained a visual element.

The TTCT 'Figural Battery' of three tests (1. Picture Construction Activity, 2. Incomplete Figure Activity, 3. Repeated Figures Activity.) scored for Fluency, Flexibility, Originality, and Elaboration, was also an easily administered test designed for groups of children.

The TTCT was therefore chosen as a possible test for creativity in the present study.

#### TESTS CHOSEN

The tests chosen therefore, for correlation with creativity scores on Art Works were:

1. The High School Personality Questionnaire, and the related Children's Personality Questionnaire, yielding a creativity score and profile, and a measure of introversion.
2. The Torrance Tests of Creative Thinking (Figural Battery) yielding scores for Fluency, Flexibility, Originality, and Elaboration.

These tests are well known, but further information is given in the chapters on administration, scoring, and data analysis.

#### SECTION 3. CRITERIA FOR MEASURING 'CREATIVITY' IN ART WORKS

This was the most difficult stage in this study. The review of literature reveals that almost all the criteria for judging works of art are concerned with aesthetics, techniques, etc., though the 'great innovators' are recognised primarily by their 'originality'; they produce something immediately recognizable as 'new'.

The early studies, e.g. Valentine (1919) and Spearman (1930), were concerned with aesthetics.

Lowenfield (1947) was concerned with the 'unity' of the aesthetic elements and hoped that judges "...will become aware of the integration of all the elements and their expressive qualities." Arnheim (1954) also stressed this integrative aspect.

In spite of the very considerable work done by Lowenfield and Arnheim in this field, Thomas (1964) concluded his survey of studies of the 'criterion problem' in art by saying that "...there is need for work on identifying the criteria on which judges base their judgements of aesthetic quality."

There is controversy in this area, but there is no doubt that works that are satisfying aesthetically may not be creative. The mechanical devices that produce interesting, aesthetically satisfying patterns are sufficient to prove this point.

The majority of judges of art works seem to rely on a 'Gestalt' type of judgement. This is similar to the type of judgement regarded as desirable by Lowenfield and Arnheim when they stress the aspect of 'integration' in a work. The 'Gestalt' judgement is desired as the effect of the whole may be greater than the sum of the parts.

The decision was taken to adopt a 'Gestalt' judgement as one of the Art Work measures, but with a bias toward 'creativity' rather than judgement of aesthetic value. This type of judgement is bound to be rather subjective in nature.

Brittain & Beittel (1960), Burkhart (1962), and Beittel (1963), have tried to develop more objective criteria for judging creativity in works of art; particularly in the work of students and children.

Burkhart (1962), as has been noted in the review of literature, has developed the concept of Spontaneity and Deliberateness in art, and has

devised methods of scoring or identifying these factors.

As the Gestalt judgement does not identify individual factors in creativity more objective or analytic approaches, such as those of Burkhart, are necessary. As the Spontaneous/Deliberate concept seemed a promising approach, it was decided to devise a measure for judging art works using this concept.

The review has indicated that 'Originality' is the major factor in creative work. The 'creativity' tests', as noted above, include this factor. As no method of measuring 'originality' in art works appeared to be available it was decided to develop one specifically for judging the art works of children. There is no reason however why it should not be adapted for judging any art works.

Another 'creativity' factor, which probably includes several sub-factors revealed by the review is that of the 'Involvement of the Subject' in his creative work. Though this is a factor which is implied rather than stated in the review, the extent to which a work shows this involvement should provide a measure of creativity.

'Involvement' includes such factors as the expression of personality, emotional content, and use of the media.

It was decided to develop a measure of 'involvement' as one of the 'creativity' judgements for the art works. This area is highly subjective, but the judgements were developed to be as objective as possible.

The four 'Art Work Judgement' instruments will be described in detail at this point; including the 'Instruction to Judges' for using these instruments with art works performed by groups of children.

#### A. THE GESTALT JUDGEMENT

The use of the term 'Gestalt' in the present context is probably not strictly correct. The work of the early Gestalt psychologists,

e.g. Wertheimer, and Köhler, investigated complex areas of visual perception. Though much of their work has been criticised, and now largely superseded, the concept of the basic 'gestalt' still has some value in terms of 'integration' effects.

Köhler (1924) stated that a Gestalt was such that its "... characteristic properties and effects cannot be put together out of the properties and effects of a like sort of its so-called parts" This interpretation of the term is the basis of the rather loose use of the word 'Gestalt' in the present study.

The major difficulty in judging any type of art work is that two different personalities are involved. The work has, as a rule, a different effect on the creator from that which it has on the observer. This effect depends on the total psychological and physiological state of each individual at the moment of creation or judgement. Objective judgements are therefore unlikely to occur with 'Gestalt' type measures. One purpose of including this type of judgement, however, was to observe what correlation might exist between this 'Gestalt' judgement and the more objective Art Work judgements developed for this study.

The brief given to the judges for the 'Gestalt Judgement' was simply stated. The criterion was that 'The judge should assess each work as more creative, or less creative.' Each judge could interpret the word 'creative' as he wished. It was felt that the fact that the word 'creative' was stressed would result in a different process of judgement from that which would have occurred if the criteria had been to judge works as good, or bad. The judges are compelled to think about the meaning of the word 'creative'. This does not mean that judges will interpret the word in the same way; but as contemporary connotations of the word are quite well known, similar considerations are likely to occur; i.e. thoughts about 'originality' 'Unusualness', etc..

The only other proviso given to the judge is that the work should be

'creative for the child', and not compared to the work of the mature, contemporary, innovating artist, or with innovations of work from the past. We do not look for the genius in the normal teaching situation; it is more likely that his impact would be immediately apparent. Though the remarks made by Torrance (1962) concerning the present day selection methods, which would have eliminated many of the great men of the past, may cause some concern in this respect.

#### SCORING INSTRUCTIONS FOR THE GESTALT JUDGEMENT

The scoring is carried out so that a score on a scale from 1 - 10 will be given to each work. The works will be scored a form, or group, at a time. This will keep the number of works involved, at each scoring session, at a manageable level.

##### Method of scoring:

1. The most creative and the least creative works are extracted from the pile of work. (Note: The word 'creative' is to be interpreted as the judge wishes, though the work must be considered to be 'creative for the child'.) The most creative work is given a score of 10, and the least creative, a score of 1. If there is more than one work in either, or both of these classes, then the same score is given to each work in that class. It is possible for the judge to consider that no work is worth 10 or 1, in a particular form's work.
2. Sort out the remaining work into four groups; 'the next most creative' 'the next to least creative', and the two intervening groups.
3. Each of these piles is divided again into more creative, or less creative.

Note: It is not necessary that each pile should have the same number of works. Nor is it necessary that there should be a pile for each score.

E.g. a group sorted according to the instructions in No.2.above may not be

divisible, in the judges opinion, as per the instructions in No.3. The judge has to decide in this case whether the group was more creative or less creative to determine the score.

4. The ten groups are then given scores: The Most Creative is given a score of ten, and the other groups (provided there are ten groups), scores of 9, 8, 7, 6, 5, 4, 3, 2, and the least creative work, a score of 1.

#### B. THE SPONTANEOUS JUDGEMENT

The first more objective criterion used in this study is that based upon the 'Spontaneous and Deliberate' concept developed by Burkhart (1960 & 1962). An outline of this concept was noted in the review of the literature.

The scoring for this judgement is based on Burkhart's 'Scale of Spontaneity and Deliberateness in art'. Burkhart suggests that the scale should be used for evaluation by pictorial comparison. After examination of the pictures that illustrate the scale, however, it was found that the different judges concerned with the present study, could not agree that the pictures matched the 'attributes for identification of spontaneity and deliberateness in art'. I.e. the verbal and visual scales did not appear to correlate in different judges' minds.

It was decided, therefore, to use only the verbal criteria; as these attributes were felt to convey a good idea of what to look for when judging products as spontaneous or deliberate.

For convenience the attributes are given again at this point,

#### Identification Chart of Attributes.

##### **SPONTANEOUS HANDLING**

Blurred or rough contours  
Active or Dynamic handling  
Bold or Rugged surfaces  
Loose and Free forms  
Variety in the use of Detail  
Flexibility in the treatment of the whole  
Functional use of the White of the paper

##### **DELIBERATE HANDLING**

Sharp or clean contours  
Static or Rigid handling  
Redefined or Polished surfaces  
Tight or restricted forms  
Repetition in the use of Detail  
Rigidity in the treatment of the whole  
Full coverage of the paper's surface.

(It should be noted here that the author has some reservations concerning the last attribute. To start with not all works are done on white paper - or even on paper at all, and certain types of media may require total coverage of the paper or whatever surface is involved. Notwithstanding this criticism, works should be judged, where possible, using this criterion)

It should also be noted that Burkhart suggests that; "These distinctions are best judged by physically recreating the execution of the work so as to sense the manner of handling." This indicates that a certain assessment of the process is inherent in this type of judgement.

Burkhart's eight classifications were each given a score, ranging from 1 - 8. For the purpose of this study the Spontaneous and Deliberate conception was treated as one bi-polar factor. This continuum was rated as 8 for the High Spontaneous end, and 1 for the High Deliberate end.

Burkhart's eight classifications are;

SH+ Spontaneous High Plus	DH+ Deliberate High Plus
SH- Spontaneous High Minus	DH- Deliberate High Minus
SL+ Spontaneous Low Plus	DL+ Deliberate Low Plus
SL- Spontaneous Low Minus	DL- Deliberate Low Minus

This means that, for scoring used in the study, works of art that are good 'aesthetically', but are not 'creative', may have a low rating. As this study is concerned with 'creativity' it was felt that the Spontaneous High Plus rating should carry the highest score.

The criteria given to the judges for scoring the works on the Spontaneity factor were the 'Attributes for the Identification of Spontaneity and Deliberateness in Art', mentioned above, and a summary of Gogel's verbal analysis of deliberate drawings and spontaneous drawings - mentioned by Burkhart (1962 p.48). This summary is as follows:

#### SPONTANEOUS WORK

Lacks specific detail, long bold free lines, range from indecisive, vague to impulsive, vigorous, energetic. Lines are active and effortlessly made (or appear so), indicate movement through loose, flexible, restless lines without regard to content.

## DELIBERATE WORK

Detailed, angular, short, definite, studied lines. Crude, stiff or confident, to distinct, refined, and polished. Static or implied movement through the direction of the lines or organization.

### SCORING INSTRUCTIONS FOR THE SPONTANEOUS JUDGEMENT

1. Divide each form or group's work, one group at a time, into a Spontaneous pile and a Deliberate pile.
  2. Divide each of these piles into High and Low (i.e. SH, SL, DH, and DL).
  3. Divide each of these four piles into Plus or Minus (i.e. SH+, SH-, SL+, SL-, DH+, DH-, DL+, DL-).
  4. Score each of the works in each pile according to the following table:
- |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|
| SH+ | SH- | SL+ | SL- | DL- | DL+ | DH- | DH+ |
| 8   | 7   | 6   | 5   | 4   | 3   | 2   | 1   |

(Note: After dividing the works into the eight groups it is advisable to check the SH+ and the DH+ piles to see if the works are still considered to be in the same Spontaneous or Deliberate category as was initially thought)

A copy of the attributes for identification of spontaneity and deliberateness in art, and Gogel's verbal analysis of spontaneous work and deliberate work, should be kept where the judge can continually refer to them.

### C. THE ORIGINALITY JUDGEMENT

'Originality', as has been observed in the review when considering definitions of creativity, is probably the major factor. It would appear to be a simple factor to observe and to measure. This is probably true in the case of great works of art, as has been mentioned. Where the work of children is concerned however, it is not quite such a simple task.

The definition given by Fliegler (1959), when he stated the creative person achieves 'originality' when he "...manipulates external symbols or objects to produce an unusual event uncommon to himself and/or his environment," is useful in this context. The operative words being 'unusual .. to himself'.



Where the developing child is concerned, it is the 'act' of being original that is the important fact, and not the 'originality' of the final product for the art connoisseur.

The criteria used for judging the 'originality' factor were chosen after considering many of the attributes revealed in the literature concerning the person, process and the product. The major criterion is, of course that the product must be judged as new, unusual, novel, clever etc. Any work produced must, of course, be relevant to the task in hand; as Barron (1963) and MacKinnon (1967) pointed out 'it must be adaptive to reality'.

Two methods were considered in the development of the 'originality' measure.

Many investigators use the method where works are compared with the norm for a population; the most unusual or rarely seen work is given the highest score. This method is suitable provided the norms are well known, or the groups involved are large enough to establish such norms, and the judges do actually choose the work that is truly original,

This method was not accepted in its entirety for three reasons;

1. the 'Gestalt' judgement already adopted should achieve the same ends,
2. it was desired to judge the work in the normal 'school form or groups' as they are usually marked, where the groups would not be large enough or random enough to ensure that the most 'unusual' in a particular group would be rated at a 'true' level of originality, and 3. such judging is still rather subjective.

The second method investigated the possibilities of using analytic, aesthetic type judgements, but rating each aesthetic factor for 'Originality' according to the degree of 'Unusualness' noted on each factor.

From a long list of aesthetic factors, seven were finally chosen; Theme Interpretation, Use of Work Space, Use of Surface, Variety, Rhythm, Use of Media, and Impact. The last factor being more subjective, as it is the 'impact on the judge' that is concerned.

Each factor is scored on a three point rating: 0, 1, & 2.

The scores for each factor are summed to give the 'Total Originality' score.

0 would be given for the usual or expected work (usual for the child), 1 is given for something unexpected, and 2 for anything considered as very unusual; i.e. unusual for the child.

It can be seen that the judge must have some conception of what is usual or unusual for the group or population involved. If he knows from experience of the group's work in the past, this is little problem; but if the group is not known then a brief 'run through' the work prior to scoring should make the 'normal' or 'usual' type of work known to him. This does, of course, owe something to the first method mentioned, but no rating occurs at this point.

It would be preferable to rate the work one factor at a time for a particular group's work. As there are seven factors involved however, it is not practical, in terms of the amount of time this would take, to do this. It is therefore not possible to avoid a certain amount of 'halo' effect; though the judge must try to be as objective as possible and judge each factor in isolation, even though he is rating work he has just judged on another factor.

The criterion measures adopted for the 'originality' factor were as follows in the scoring instructions. This should be regarded as a provisional measuring instrument only, as further developments are being considered.

#### SCORING INSTRUCTIONS FOR THE ORIGINALITY JUDGEMENT

There are seven factors that make up the overall originality score. Each factor is given a rating of 0, 1, or 2, according to the following table. Each work is rated on all seven factors at one time.

FACTOR	RATING		
	0	1	2
1. Theme Interpretation (See Note 1.)	expected as usual or normal	something unusual	very unusual
2. Use of work space	work too small crushed or insignificant	symmetry only or average use of space	balance and/or asymmetry, use of tension
3. Use of Surface	surface mainly unused	all surface used (Note 2)	surface considered as an integral part
4. Variety	line or plane only	some use of texture or elaboration	contrasts and use of considerable textural elaboration
5. Rhythm	none	some rhythm	overall and subsidiary rhythms, also tensions
6. Use of Media	simplest possible	extension of simplest	exploration of several possibilities of medium
7. Impact on Judge (it does not matter if the impact is not 'favourable')	none, or very little impact	some impact	immediate strong impact

The scores for the seven factors are totalled to give the 'originality' score.

Note.1. It is important that the interpretation of any theme - whether it is the subject's own choice, or a set theme - should be 'relevant' to theme, and not merely unusual.

Note.2. If the work is not finished the judge should consider if it would have been covered if sufficient time had been allowed; also, in the case of the backward child, a gap left between parts of a composition, e.g. between the sky and the horizon, should NOT be considered as an integral part of the work.

#### D. THE INVOLVEMENT JUDGEMENT

This judgement, the most subjective of the analytic judgements, was developed in similar lines to the 'originality' judgement.

As has been observed in the literature a number of researchers have noted the degree of involvement, expression of emotion, the personality of the creator showing in the work, etc., This was noted by early work of Valentine (1919), and Spearman (1930), and the later work of Arnheim (1954), and Brittain and Beittel (1960).

The main difficulty in assessing whether the subject has expressed himself and become involved in his work, is that the judge may 'project' his own personality and emotions into his interpretation of the work. Care must be taken therefore, to judge as objectively as possible if the subject himself is involved.

The actual definition of 'involvement' in the present context is not easy. The opposite poles of the involvement factor are in some respects similar to the spontaneous/deliberate continuum.

In the art work in which the involvement factor can be seen the child identifies himself with his creation. It becomes a part of him, means a lot to him, and 'personification' (endowment of natural or man-made phenomena with human-like attributes) may occur. This personification may even occur in abstract work, though this may be difficult to detect unless very strong. The subject can be said to give some of his own 'Life' to the work.

The non-involved individual is more in the role of the detached spectator, who coolly, calmly and unemotionally records or reports what he sees or thinks. This work may be highly developed on rational, aesthetic grounds; i.e. the work can exhibit qualities of balance, colour, rhythm, variety, etc. which may be attractive, and the craftsmanship of a high standard. The work as a whole, however, remains on the purely intellectual plane and does not reveal any signs of emotion that the subject may feel, if he does feel any, concerning the theme of his work.

These poles are more easily seen, of course, in the work of the mature artist rather than in the work of children.

It was resolved to rate the 'involvement' factor by totalling the scores of five sub-factors.

These five factors are rated in a similar way to the rating for the 'originality' factor, i.e. 0, 1, and 2. The five factors are: Life, Animation, Emotion, Media, and Effect of Media (i.e. effect on the subject).

As these terms are not as readily understandable as those of the 'originality' factor, definitions had to be given in more detail. These were included as notes to the table.

#### SCORING INSTRUCTIONS FOR THE INVOLVEMENT FACTOR.

There are five factors to be rated as 0, 1, or 2. The sum total of these ratings provides the score for 'involvement'.

The works are rated one group at a time, and each work is scored on all five factors at the same time, as was done in scoring the originality factor, while trying to be as objective as possible to avoid the 'halo' effect.

FACTOR		SCORE	
No. & Title	0	1	2
1. Life	no life human, animal plant, or personification	some life or personification	much life involvement
2. Animation	none	some movement	a lot of movement
3. Emotion	none	some emotion	a lot of emotion
4. Media	very simple use of media	more subtle use of media	evocative use of media. Subtle and strong colour.

5. Effect of Media	little effect simplest use	some effect medium must be influencing child	strong influence of media; has almost directed the way the subject works
--------------------	-------------------------------	---	--

The following are definitions of each factor to assist the judge:

#### 1 LIFE

This factor refers to aspects of the work that are 'living'. This can be based on the human figure or other living or inorganic matter that is 'personalized'; i.e. has been endowed with personality.

If there is no 'life' present, this factor is rated as 0.

As most children who try to express something of themselves do put life of some description in their work, this factor is not easy to find. Most judges could tell the difference between a tree that looks 'alive', and one that is used as a scientific symbol or photographic reportage.

The term 'Life', in this context, should not be confused with a term often used in judging art works, i.e. the term 'lively'. It must be specifically interpreted as the degree to which a subject has involved himself with making things 'live' in the work.

#### 2 ANIMATION

This factor is interpreted in terms of 'movement'. I.e. objects, whether living or not, must appear to be in motion. Abstract motifs, symbols etc, can be seen to have this quality, even though they may not be 'personalized' as in the 'life' factor.

Such things as rhythm, line, colour etc. enter into this judgement.

#### 3. EMOTION

This may be similar to the life factor, but it is possible that a completely abstract work may have easily recognizable emotional connotations. This may take the form of personalization, but can also be much more 'symbolic'.

Such 'symbolic' work is obviously very difficult to assess as, usually only the subject can know what the symbolism means to him. It may be that the safest way to judge this factor is to assess if the work makes the judge feel 'uneasy' in any way; if a feeling occurs that the work is trying to say something, but the judge cannot understand what.

Normally, however, emotions that are expressed through such vehicles as the human face, e.g. smiling for pleasure, happiness, etc. or screaming for pain, fear, etc., are reasonable easy to score.

#### 4. MEDIA

This factor is concerned with 'involvement in media'. It is scored according to the degree that the subject uses the media in a deliberate, evocative manner. I.e. it is felt that the subject has used a particular effect of the media to express what he feels.

It must be noted that this is different to the use of the media in the 'originality' factor, where the stress was on 'unusual' use of the media.

#### 5. EFFECT OF MEDIA

This is difficult to judge. Basically the child should appear to be influenced by the media itself as the work progresses.

Provided the work shows that he has thought about, or felt, the qualities of the media, and used his discoveries to express his feelings, he should be scored high.

This completes the development and instructions for scoring the 'art work' judgements.

It is realized, of course, that although these judgements are devised as objectively as possible, there must still be a strong subjective element in the actual judging.

It is advisable to use at least two judges, and check the correlation between their ratings, when using these methods of judging for experimental purposes.

#### SUMMARY

Eighty-six children - 45 boys and girls aged  $11\frac{1}{2}$  and 41 boys and girls aged  $13\frac{1}{2}$  - drawn from a rural secondary school population, were involved in this study.

The instruments selected were:

- (a) The HSPQ/CPQ yielding a 'creativity' score, and an Exvia/Invia score.
- (b) The TTCT (Figural Battery) scored according to the manual.
- (c) Four 'Art Work Judgements'. A 'Gestalt' judgement, a 'Spontaneous' judgement, an 'Originality' judgement, and an 'Involvement' judgement.

## CHAPTER SIX

### ADMINISTRATION PROCEDURES

The tests were administered and the art works performed between November 1967 and April 1968 (for a complete timetable of administrations for studies to test Hypotheses A and B, see Appendix p.2&3).

The procedures for this study will be divided into two sections;  
1. The Tests, and 2. the Art Works.

#### SECTION 1 Administration of the Creativity Tests and the Personality Tests.

##### (a) The Torrance Tests of Creative Thinking (TTCT)

These tests were administered in April 1968 (see Note 1 at end of chapter).

The tests, and all instruments and art works involved in the study, were administered during normal class periods. This was done in order to avoid interruption of normal school life; and to avoid, as much as possible, a 'test atmosphere' which might have created too much tension.

Figural Form A of the TTCT was used. The administration followed the procedures laid down in the test manual (TTCT, Directions Manual and Scoring Guide, Figural Test Booklet A, Research Edition, Dec 1967 revision).

The instructions were read as directed, and the 10 minute time limit allowed for each activity was adhered to. No difficulties were experienced during the test administration.

The tests were performed with forms 1 and 2 First Years and forms 1 and 2 Third Years. Subjects who were absent were given the tests the day that they returned.

The majority of subjects appeared to enjoy doing these tests.

##### (b) The Personality Test: The Children's Personality Questionnaire and the equivalent High School Personality Questionnaire.(CPQ/HSPQ).

The CPQ and HSPQ were administered, late in 1967, to the two First Year and two Third Year forms.



No administration problems were encountered. The test was performed according to the manuals.

There are no time limits for these tests, but the average time taken to do the tests was approximately 50 Minutes. This is reported as 'normal' in the manuals. A few subjects took longer, and these were catered for as recommended in the manual.

As the same time as the instructions were read, it was impressed upon the subjects that, as each person was different and would answer the questions in different ways, there was no point in 'copying' anyone else's answers.

Help was given, within the limits of the instructions, with problems in reading. Some American terminology required 'translation' in some cases. One subject, with severe reading problems, had the test individually, verbally administered, as allowed for in the test instructions.

All the subjects worked well and appeared involved for the whole time they took to complete the test. On completion, a number of subjects remarked that they had 'enjoyed doing the test'.

## SECTION 2 The Art Works

### (a) Choice of Art Works

The procedure for obtaining works of art performed by the subjects for scoring purposes was not as simple as at first thought. Initially it was considered that it would be suitable to score works of art that the subjects had done in the recent past. On reflection, there were snags that made this procedure undesirable: E.g.

- (i) a subject's ability might have changed,
- (ii) works so chosen would have been done at different stages in the various subjects' courses,
- (iii) a variety of factors may have influenced the subject's work e.g. a subject may have been actively helped.
- (iv) one subject may have been allowed much more time than another, due to factors beyond the subject's control, e.g. illness, school administration changes etc.

It was apparent that too many uncontrolled variables were inherent in the procedure of choosing art work from normal course work.

It was decided, therefore, to obtain two art performances by each subject, with as many variables held constant as possible.

It was realized that to a certain extent this would put the subject in a 'test situation', but this was felt preferable to not knowing the 'history' of each art work.

The Art Works would be performed during normal classroom periods, and in as 'normal' a classroom 'atmosphere' as possible. A time limit similar for both works, would be set; even though subjects may not 'finish' the work, enough should be completed for scoring purposes.

Of the two Art Works performed, one would be a 'set subject' and the second, an 'own choice' of theme.

It was also decided to restrict the work to two dimensions only for practical administrative, storage, and scoring reasons. For the 'set theme' the subject would be given advance notice; and for both works would be told what media would be available.

The choice of theme for the 'set' work had to meet certain requirements:-

- (a) it had to be capable of a wide interpretation,
- (b) it had to allow for original expression in representational, abstract, and emotional terms,
- (c) it had to be interpretable within the limits of the subjects' experience,
- (d) it had to allow for expression in terms of man-made phenomena, man himself, or other natural phenomena or experience.

A number of themes were considered, but the majority were rejected as not meeting the requirements.

E.g.: A Cafe Scene - not open to wide enough interpretation.

The Forest - evocative in terms of mainly natural phenomena.

The Town - too evocative of man-made phenomena.

The theme chosen finally was 'The Park'. It was felt that this theme would meet the requirements. There are a wide variety of 'parks' - nature parks, pleasure parks, playground parks, sporting parks, public parks, car parks, park zoos etc.; thus catering for man-made and natural phenomena, representational and abstract interpretations, and allowing scope for originality. The theme was also likely to be within the subjects' experience.

The theme would be given to the subject two weeks before the actual performance; they would be informed at the same time that the second work would be 'their own choice'. They would thus have ample time to think about the work.

They would also be informed that they would have one normal 'double period' in which to do the work (approximately 60 mins. actual working time), so they would need to work quickly, and know what they were going to do.

They would be informed that work that was to be unusual, original, and that their 'own idea' would be rated high in the scoring.

#### (b) Administration of Art Work Performances.

The procedures outlined above were observed in the administration of the Art Work performances.

The Art Works were performed in late 1967 by two 1st Year Groups and two 3rd Year Groups.

The majority of the subjects had made use of the advance information, and knew what they were going to do, and what media they were going to use. Some subjects obviously had not thought and wasted working time; though a few of these did manage to 'finish' in the time allowed.

A difference was noted in the degree of 'involvement' of the

subjects. The majority worked hard and appeared immersed in their work. A few of the 3rd Year subjects did not appear interested, particularly in the 'set theme', and did very little.

One 1st Year form had the distraction of a hockey match on the playground outside the window; they soon settled down and disregarded this, however.

The 1st Years, as would be expected, were more restricted in their choice of media. They did, however, work more quickly than the 3rd Years. A few subjects chose wax crayon, in preference to paint, pencil, charcoal, etc.. In some cases this was chosen as a quick easy way out, but others had chosen it for the effect. The choice of media however, did not normally affect the speed of work.

On the whole, the 1st Years performed better than did the 3rd Years. More of the 3rd Years said they 'had finished' in less than the time allowed; in the majority of such cases examination of the 'finished' work revealed that this was more a lack of interest than a statement of fact.

Most subjects however, produced work that could be considered, for scoring purposes, 'finished'. There were a few subjects who could obviously have benefited from a longer working period. They had done enough, however, to be assessed, and give the judges an idea of what the 'finished work' would have been.

As it was a 'test situation' it was feared that some degree of 'Hawthorne Effect' might lead to a very different type of performance from that normally produced by a subject. Spot check comparisons, with various ability levels, did not reveal any noticeable differences between the normal work and test work.

All the subjects (86, 1st and 3rd Years, Males and Females) performed Art Work 1 (The Park) and Art Work 2 (Own Choice), within the time allowed, and with the environment for each group and each performance kept as

similar as possible in normal school classroom conditions.

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NOTE:1

When this study commenced the Minnesota Tests of Creative Thinking (MTCT - scoring method; Yamamoto 1964) were the only tests of this type available. The Torrance Tests of Creative Thinking became available in 1967, and were ordered. They did not arrive, however, until early 1968.

As it had been previously decided to test with the MTCT, they were administered, scored, and correlations performed with the scores on the Art Works and the CPQ/HSPQ.

The intention was to use the Torrance tests (TTCT) as soon as they arrived. In the TTCT manual however, Torrance advised that at least three months should elapse before re-administration of his tests. As the MTCT and the TTCT were similar it was considered advisable to postpone administration of the TTCT for about four months (till April 1968), to avoid such 'test sophistication'.

The present study reports the correlations of the TTCT scores with the scores of the Art Works and the CPQ/HSPQ, which were administered late in 1967.

The correlations of the MTCT with the CPQ/HSPQ and the Art Works were reported in a dissertation for the Diploma of Advanced Study in Education (Williams 1968) A brief summary of the results of that study is given in Chapter 9.

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## CHAPTER SEVEN

### SCORING TESTS AND ART WORKS

The scoring of the tests was carried out as instructed in the manuals.

The Manuals for the Torrance Tests of Creative Thinking (TTCT, Norms Technical Manual, 1966; and TTCT Directions Manual and Scoring Guide, Figural Test Booklet A, Research Edition, Dec. 1967 revision) give general rationales and scoring instructions, and comprehensive scoring instructions for the three individual activities.

The CPQ and HSPQ were scored using the manuals and keys available (CPQ, Form A 1963 four-form edition, and 'Interim Manual for the CPQ, 1963; HSPQ, Form A, 2nd Edition, and Manual 1963). IPAT Bulletin No. 10 was also used when obtaining the 'creativity' score.

The 'Art Works' were scored using the methods for judging discussed in Chapter Five.

Few difficulties were encountered in scoring the tests. Those that arose scoring the Art Works were mainly due to subjective factors inherent to this study.

The scoring of the Tests and Art Works is discussed in separate sections.

The complete scores for each subject in the Tests and Art Works are given in the Appendix (p p. 4 - 21 )

#### SECTION 1: Scoring The Creativity Test

The scoring method on the Torrance Tests of Creative Thinking (TTCT Figural Test A) is objective; for this reason it was decided to use only one scorer. The instructions in the 'Directions Manual and Scoring Guide' were closely followed, and few difficulties in the scoring occurred.

The scoring was carried out on the TTCT 'Scoring Worksheets' (designed to reduce the time factor in scoring and increase the reliability). The scores on each activity (1, 2, & 3) are summed for each of the four factors to give Total Fluency, Total Flexibility, Total Originality, and Total

Elaboration (Note; The 'Total Scores' are also given in the Appendix). It should be noted that for Activity 1 there can be no Fluency or Flexibility score due to the fact that there is only one response.

Fluency, in Activities 2 & 3, is the total number of responses. For the Flexibility score, each response is placed in a 'category', and the number of categories counted to give the score. A number of responses, of course, may be placed in the same category. An example of a number of responses yielding a low flexibility score, is seen in the responses to Activity 2 of Subject No. 54 (TTCT example, No. 1 Appendix p. 24-25); responses No's. 1, 3, 4, and 7 are all abstract 'line' designs, and are thus placed in the same category; as each 'category' only counts as 'one' the Flexibility score for this activity is 4.

Originality is also scored in 'categories', but in this case the categories are given 'weighted scores' according to the percentage of commonly given responses.

The Elaboration score is the count of 'additions to the minimum basic idea'.

The principles for the scoring of the four factors are the same for Activities 2 and 3, though the 'categories' are different of course.

In Activity 3 'Bonus Points' for Originality are given where two or more sets of lines are combined in the response. The work of Subject No. 71 (TTCT example No. 2 Appendix p. 26-27) in Activity 3, is a good example of responses that earn such points.

Examples of high and low scoring responses, on the four factors for the three activities, are shown in the Appendix (TTCT Examples for Study to Test Hypothesis A; No's 1-11 p. 24-45); examples of First and Third year subjects are shown.

The low scoring responses of Subject No. 23 (Example No. 3 ) are exceptional; The responses of Subject No. 9 (Example No. 4 ) are more typical of low scoring responses.

The responses of Subject No.32 (Example No. 5 ) are interesting, in that they are among the highest, in that particular form, for Flexibility, Originality and Elaboration, and are only two points less than the highest for Fluency.

The only difficulties that occurred were of the type referred to in regard to Subject No.54 above; i.e. deciding in which 'category' a response should be placed. All such problems were of a minor nature, however. The Manual allows 'new categories' to be decided on when 'rare' responses are made, that do not fit 'categories' that are given. A few such 'new' categories were made to accomodate the few 'rare' responses.

The scoring, in general, was easy, but did take some considerable time for all the eighty-six subjects' responses to the three activities.

#### SECTION 2: Scoring the Personality Test.

No difficulties were experienced in scoring the CPQ and HSPQ. The raw scores were converted to sten scores, using the Norm Tables, for each factor. The second order factors were derived from these. The Extraversion factor was derived as directed in the manuals. The Creativity factor score was obtained as advised in Bulletin No.10 (factors and calculations for the CPQ Creativity score were based on note 1., and subsequently confirmed by the IPAT).

It was decided to use the Extraversion and Creativity 'raw scores' in the correlations, as all the other scores from the TTCT and Art Works, were also in raw form.

#### SECTION 3: Scoring the Art Works.

The scoring was carried out using the methods described in Chapter Five.

Due to the more subjective nature of the Art Work Judgements, it was decided to employ a second judge for scoring some of the work, to test the reliability of the scoring methods. This second judge had some experience of art teaching, but had not taught for some years. This judge had no knowledge of the usual type of work performed by the subjects. The only information



given to the judge were the 'scoring instructions' for each judgement (Gestalt, Spontaneous, Originality, Involvement; as stated in Chapter Five, Section 3).

The Art Works performed by the four forms involved in the study, were scored one form at a time, and one judgement at a time; to avoid any 'halo effect' as much as possible. For example; for 1st Year, Form One, Art Work 1 was scored on the Gestalt judgement, followed by Art Work 2 scored on the same judgement. The remaining work of the 1st Year was scored in a similar way, followed by the two forms comprising the 3rd year.

A gap of several days was allowed between each Art Judgement so that the judges did not become too familiar with the work; though some familiarity with the more 'striking' works was inevitable by the time the judgements were completed.

When one judgement had been completed, for the two Art Works and the four forms, the highest and lowest scoring works from each form were compared, first for Art Work 1 and then for Art Work 2, to check that the judgements were consistent. If any reassessment was necessary, it was performed at this stage.

The scoring on the four Art Work Judgements is discussed in the following four subsections.

#### A. The Gestalt Judgement.

The main difficulty experienced in scoring the Gestalt judgement was in the interpretation of the word 'creative'. As directed, the judges had to define 'creative' in their own way. However, the judges involved found, on comparisons made after the scoring, that the concept of 'originality' came high in their personal interpretations of the meaning of the word 'creativity'.

The scoring was completed as directed. When the highest and lowest scores were compared, only one reassessment was necessary, and the difference was not great in this case.

The set theme, 'The Park', was reasonably easy to assess, but the 'own choice of theme' was more difficult; there was not as much indication of a deviation from a 'norm' as could be found when all the subjects were tackling the same problem. The reliability of the Gestalt judgement in the 'own choice' Art Work was therefore likely to be low.

Examples of high and low scoring works for the Gestalt judgement, and for the other three judgements, are given in the Appendix (p.p.77-81).

The work of subject No.13. (illustration No.1) is an example of a high Gestalt score on Art Work 1; low scoring on this judgement is seen in the work of Subject No.47 (Illustration No.8).

High scoring on Art Work 2 is achieved by subjects No.41 (Illustration 2) and No.69 (Illustration 5). Work by subject No.4 (Illustration 7) scores low in Art Work 2.

#### B. The Spontaneous Judgement

This was probably the most difficult of the Art Work judgements. The judges had more 'criteria' to keep in mind; i.e. reference had to be made to the 'Attributes for the Identification of Spontaneity and Deliberateness in Art' and the 'Summary of Gogel's Verbal Analysis of Deliberate and Spontaneous Drawings' (see Chapter Five, Section 3). In practice a 'large print' version of the scoring criteria was placed so that continual reference was possible.

The major difficulty was deciding at which 'pole' a work should be placed; i.e. at the 'Spontaneous High' or 'Deliberate High' pole for the highest and lowest scoring works respectively.

It was not easy to overcome the 'aesthetic' effect of a work and judge it on a 'spontaneous' basis. It was also difficult to avoid considerations of 'creative' as specifically differentiated from 'spontaneous'. Some 'Deliberate' works immediately appeared to be creative. Careful interpretation was required to ensure that such works were scored 'low on spontaneity'.

Art Works such as those of subjects No.41 (Illust.2) and No.65 (Illust.3) are examples of works scoring high in spontaneity. The work of subjects No.1 (Illust.6), and No.86 (Illust. 9) are examples of those who score low in 'spontaneity'; i.e. 'high' in 'deliberateness'.

The highest and lowest works for each art work and each form were compared, and two reversals of polarity were made as a result. When this occurred, the whole of that form's work, on that art work, was reassessed. Few alterations in scoring resulted from this, apart from the highest and lowest scores. It was only when the High Deliberate and High Spontaneous works were compared that it was easy to see that they were misplaced.

It was thought likely that judges may differ when scoring this 'Spontaneous' judgement.

### C. The Originality Judgement

The scoring for this more objective type of judgement was reasonably easy, even though each work had to be assessed on seven factors and the factor scores summed to obtain the total 'originality' score.

This judgement had the advantage that each work was assessed in isolation and not in comparison with other works, as was the case in the two previous judgements.

The method was slightly more time consuming,. As there were seven factors (see Chapter Five: Section 3, C), this inevitably took longer than the single judgements for Gestalt and Spontaneous scoring. As there were no comparisons, however, the time spent in actually scoring was similar.

Difficulty was expected in scoring Factor 1 (Interpretation). The judges may have had problems deciding what was unusual or very unusual, if they had no knowledge of the Art Work produced by the subjects as a whole. In the event, of course, some knowledge in this area had been gained in scoring the Gestalt and Spontaneous judgements. If this method is used without previous 'run throughs' of the work to observe what is the 'normal' work response, then difficulty may well occur.

Factor 5 (Rhythm) was not defined, as it was assumed that it would mean the same thing to the different judges, who in this case had both been trained in art criteria. Should judges who were not 'art trained' do the scoring, some further guide would be needed in this area. The judges involved in the present study conferred, after the scoring, and agreed on the following interpretation of the term 'Rhythm'.

'Basically, Rhythm is repetition: simple (e.g. grid pattern), at the lowest level, and much more complex, interlinked, interacting repetitions with great variety of size, colour, etc. at the highest level. 'Tensions' i.e. strong rhythms that tend to strain components out of balance, should be looked for at the highest levels.'

It was realized however, that only judges who had had training or experience in art would be likely to interpret this factor in an essentially similar way.

Little trouble was found in scoring the remaining five factors; though it is possible that judges not trained in art may again have found some difficulty.

Examples of work that scored high in 'originality' (total score) can be seen in Illustrations No's 1 to 5; whilst Illustrations No. 7 and 8 are examples of low scoring works.

#### D. The Involvement Judgement.

It was feared that this judgement might have been difficult; in practice it was not found as difficult as the Gestalt and Spontaneous judgements though it was more difficult than the Originality judgement. Some factors (see Chapter Five. Section 3, D for the five factors) proved more difficult than others, though, provided the definitions and notes were carefully observed, only factors 3 (Emotion) and 5 (Effect of Media on the Subject) presented problems.

The Emotion factor, in the actual assessment, appeared to be similar to factor 1 (Life).

Factor 5 was more subjective than the others in the scoring, and it

was not easy to detect in the majority of the works; though, in the work of some subjects it was felt that the media was affecting the way that subject worked.

Examples of 'High Involvement' are shown in Illustrations No's 3 and 5; 'Low Involvement' is seen in Illustrations No's 7 and 8.

As mentioned previously, two judges were used to score some of the art works. These judges scored the work of two of the forms. The judgements on one of the forms was considered as a 'trial'; the scores on the work of the second form only were used for interjudge correlation purposes.

In general, no major difficulties were experienced in scoring the Torrance Tests of Creative Thinking, The CPQ and HSPQ, or the Art Works.

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## CHAPTER EIGHT

### RESULTS AND DATA ANALYSIS

The concern of this chapter is to describe the statistical method of analysis used, and to present the results obtained.

This analysis and statement is presented in two sections: Interjudge Correlations, and Correlations of the Tests and Art Works.

#### SECTION 1: INTERJUDGE CORRELATIONS

As previously stated, the scores of one form only were used to test the reliability of the scoring method. Two judges had previously scored the work of another form as a 'trial', where the author, as the deviser of the methods of scoring, was on hand to clarify the instructions or definitions for the second judge. Few such clarifications were needed, but it was considered inadvisable to use the scores of this trial as data for the interjudge correlations, as some 'contaminations' may have occurred. Only the scores of the form whose Art Works were marked independently by the two judges were used in the analysis.

The scores of the 1st Year Form 1 were used for the correlations, as this was the largest group (22 subjects at the time of the scoring).

The scores for the four judgements, Gestalt, Spontaneous, Originality, and Involvement, were correlated separately for the two Art Works; resulting in eight correlations. Pearson Product-moment Correlations were calculated. (The 'r's' obtained were: Gestalt Work 1 .674, Work 2 .406. Spontaneous Work 1 .781, Work 2 .579, Involvement Work 1 .737, Work 2 .898, and Originality Work 1 .843, Work 2 .841) The 't' test of significance was applied (Fisher's test of significance for small numbers of subjects), and the .01 level of significance chosen as the level of acceptance of the reliability of the scoring methods.

All the Interjudge Correlations were positive. All were significant well beyond the .01 level of significance, except the correlation for the Gestalt Judgement Art Work 2, which was only significant at  $p \leq .10$ .

The scores & results are given in full in the Appendix (Appendix p.112 ).

## SECTION 2: TESTS AND ART WORKS CORRELATIONS

### A. Data and Statistical Method

The decision was taken to use the triangular matrix correlation method as the statistical instrument for testing Hypothesis A. A computer programme was used to obtain the correlations for the various groups involved; i.e. Year, Group and Sex, and overall groupings.

The levels of significance chosen for examination of the results were  $p \leq .05$  and  $p \leq .01$ ; the .05 level being regarded more as an indication of 'trend'. (Note; the table of 'r' used for  $p \leq .05$  and  $p \leq .01$  was a 'two tail' table, as the possibility of negative correlations was taken into account)

As mentioned before (Chapter Six: Note 1) a previous study of the MTCT (Minnesota Tests of Creative Thinking - Non-Verbal Form), which was similar in form and scoring to the TTCT, had been performed. A similar matrix correlation method had been used for this study. It was decided to include the MTCT scores in the correlations for the present study, to compare the merits of the MTCT and the TTCT. This comparison is dealt with briefly here as it is not the prime concern of this study.

The Originality factor and the Elaboration factor are common to the TTCT and the MTCT in all the Activities and Tasks of the non-verbal tests. As these factors are also the major factors in the creativity syndrome, it was decided to use only these factors in the correlations for this present study; the Originality factor being the factor of the main interest.

The two scores derived from the CPQ/HSPQ (i.e. 2nd order factors Creativity and Extraversion - Exvia) were also included in the matrix correlations. The groupings for the correlations were as follows:

All Subjects, Males, Females.  
1st Year Subjects, 1st Year Males, 1st Year Females.  
3rd Year Subjects, 3rd Year Males, 3rd Year Females.  
1st Year Form 1. 1st Year Form 1 Males, 1st Year Form 1 Females.  
1st " 2. 1st " " 2 " 1st " " 2 "  
3rd " 1. 3rd " " 1 " 3rd " " 1 "  
3rd " 2. 3rd " " 2 " 3rd " " 2 "  
Twenty One groups in all.

The scores of the following factors from the Tests and Art were used in the correlations:

MTCT Task 1: Originality, Elaboration.  
Task 2: Originality, Elaboration.  
Task 3: Originality, Elaboration.  
CPQ/HSPQ : Creativity, Extraversion.  
TTCT : Activity 1: Originality, Elaboration.  
Activity 2: Originality, Elaboration.  
Activity 3: Originality, Elaboration.  
Total : Originality, Elaboration.  
Art Work 1 : Gestalt, Spontaneous, Originality, Involvement.  
2 : Gestalt, Spontaneous, Originality, Involvement.

Twenty-Four scores in all for each subject. (The complete data for each subject is given in the Appendix: pp.4-21).

#### B. Results of examination of the Correlation Matrices

The results of the examination of the correlations are given in sections. There are seven sections in all, the first three being those that are primarily concerned with testing Hypothesis A; i.e. the relationships between the Tests and the Art Works. The fourth and fifth sections show the relationships found among the sub-tests and factors of the Art Work judgements and the TTCT respectively. The sixth and seventh sections show, briefly, the relationships between the TTCT and the MTCT, and the Art Works&MTCT respectively.

The headings for the sections are as follows:-

- (i) Correlations: Creativity Tests (TTCT) and Art Works.
- (ii) Correlations: Personality Test (CPQ/HSPQ) and Art Works
- (iii) Correlations: Personality Tests and Creativity Tests
- (iv) Intercorrelations: Art Works
- (v) Intercorrelations: Creativity Tests.
- (vi) Correlations TTCT and MTCT.
- (vii) Correlations: Art Works and MTCT.

#### (i) Correlations: Creativity Tests (TTCT) and Art Works

Each of the Art Work Judgements, eight in all (four for Work 1 and four for Work 2), were correlated with the Originality and Elaboration scores on the three Activities of the TTCT plus the Total Originality and Elaboration scores.

Those correlations that are significant at the chosen levels ( $p \leq .05$ ) &  $p \leq .01$ ) are shown in Tables 8:1 and 8:1A (next page)

Table 8:1 shows the significant correlations found for the Total Originality and Total Elaboration scores of the TTCT and the scores on the



TABLE 8:1 CORRELATIONS, TTCT (Totals) AND ART WORKS

TTCT Total Originality and Elaboration correlations with Art Works 1 and 2, for the 21 Groups. Significant Correlations are shown for: Gestalt (G), Spontaneous (S), Originality (O), and Involvement (I), at the  $p \leq .05$ , and  $p \leq .01$  levels.

CODE for levels of significance: G S O I  $p \leq .05$

G S O I  $p \leq .01$

GROUPS	N	TTCT & ART WORK 1		TTCT ART WORK 2	
		ORIG	ELAB	ORIG	ELAB
All Subjects	26	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
1st Year Subjects	45		G <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>
3rd Year Subjects	41	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
Males	42	G S <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>
Females	44	<u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
1st Year Males	22		<u>I</u>		
1st Year Females	23		<u>O</u>		
3rd Year Males	20	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	G <u>O</u> <u>I</u>
3rd Year Females	21	<u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
1st Yr Form 1	21	S	G <u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>
" " 1 Males	11	S	G <u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>
" " 1 F	10				
1st Yr Form 2	24				
" " 2 Males	11	G			
" " 2 F	13				
3rd Yr Form 1	22		<u>G</u> <u>O</u> <u>I</u>	<u>O</u>	S <u>O</u> <u>I</u>
" " 1 Males	11		<u>I</u>		
" " 1 F	11		G <u>O</u> <u>I</u>	<u>I</u>	G <u>O</u> <u>I</u>
3rd Yr Form 2	19	<u>G</u> <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	G <u>O</u>	<u>G</u> <u>O</u> <u>I</u>
" " 2 Males	9	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u>		<u>G</u> <u>O</u> <u>I</u>
" " 2 F	10		<u>O</u>	<u>O</u>	<u>G</u> <u>O</u> <u>I</u>

NOTE: G (All subjects, TTCT & ART WORKS 2, ORIG) = Nearly Sign at  $p \leq .05$

TABLE 8:1A CORRELATIONS, TTCT (ACTS 1, 2, &amp; 3) AND ART WORKS: ALL GROUPS.

TTCT Acts. 1, 2, & 3 for Originality and Elaboration, for Art Works 1 & 2 (Wk1, Wk2). Code: Yr = Year, Frm = Form, M = Male, F = Female.

Significance level code as for Table One.

GROUPS		TTCT					
		ACT 1		ACT 2		ACT 3	
		ORIG	ELAB	ORIG	ELAB	ORIG	ELAB
All Subjects	Wk1	G	<u>G</u> <u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>	G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2		<u>G</u> <u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
1st Yr S's	Wk1	G <u>I</u>			G <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>
	Wk2	<u>I</u>			G <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>
3rd Ys S's	Wk1		G <u>O</u>		G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2		<u>G</u> <u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>	G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
Males	Wk1		<u>G</u> <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>	G <u>S</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2		G <u>O</u> <u>I</u>		<u>O</u> <u>I</u>		<u>G</u> <u>O</u> <u>I</u>
Females	Wk1		<u>O</u>		<u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>O</u> <u>I</u>
	Wk2		G <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	G <u>O</u> <u>I</u>
1st Yr Males	Wk1		<u>I</u>				<u>I</u>
	Wk2		<u>I</u>				
1st Yr Females	Wk1				<u>O</u>		<u>O</u>
	Wk2	G <u>O</u> <u>I</u>					
3rd Yr Males	Wk1		<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u>	G <u>O</u>	G <u>O</u> <u>I</u>	G <u>S</u> <u>O</u> <u>I</u>
	Wk2	<u>-I</u>	G <u>O</u>	<u>O</u>			G <u>O</u> <u>I</u>
3rd Yr Females	Wk1				<u>O</u> <u>I</u>	<u>I</u>	G <u>O</u> <u>I</u>
	Wk2		G		<u>G</u> <u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
1st Yr Frm 1	Wk1				<u>O</u> <u>I</u>	<u>S</u>	<u>O</u> <u>I</u>
	Wk2				G <u>O</u> <u>I</u>		G <u>O</u> <u>I</u>
1st Yr Frm 1 M	Wk1				<u>I</u>		
	Wk2		<u>I</u>		G <u>O</u> <u>I</u>		
1st Yr Frm 1 F	Wk1						
	Wk2						
1st Yr Frm 2	Wk1	G <u>I</u>		<u>I</u>			
	Wk2	<u>I</u>					
1st Yr Frm 2 M	Wk1	<u>G</u>				G	<u>I</u>
	Wk2						
1st Yr Frm 2 F	Wk1			<u>I</u>			
	Wk2						
3rd Yr Frm 1	Wk1				<u>O</u> <u>I</u>	<u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2				<u>S</u>	G <u>O</u> <u>I</u>	G <u>O</u> <u>I</u>
3rd Yr Frm1 M	Wk1			G			G
	Wk2					<u>O</u>	
3rd Yr Frm1 F	Wk1		G <u>O</u> <u>I</u>		<u>I</u>	<u>I</u>	G <u>O</u> <u>I</u>
	Wk2				G <u>O</u> <u>I</u>	G <u>S</u> <u>I</u>	G <u>O</u> <u>I</u>
3rd Yr Form 2	Wk1	G <u>O</u>	<u>O</u>	<u>O</u>	G <u>O</u> <u>I</u>	G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2	<u>-S</u>	<u>G</u> <u>O</u> <u>I</u>	<u>O</u>	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
3rd Yr Fm 2 M	Wk1		<u>G</u> <u>O</u>	<u>O</u>	<u>G</u> <u>O</u>	G <u>O</u> <u>I</u>	<u>G</u> <u>O</u> <u>I</u>
	Wk2		<u>G</u> <u>O</u>	<u>O</u>	G <u>O</u>	G	G- <u>S</u> <u>O</u> <u>I</u>
3rd Yr Fm 2 F	Wk1	G					
	Wk2	<u>-S</u>	<u>G</u>		G <u>O</u> <u>I</u>	<u>O</u>	G

four judgements on Art Works 1 and 2; for all 21 subject groups.

The overall effect, i.e. TTCT Totals, Art Works 1 & 2 for All Subjects, revealed the major trends found among the sub-tests for various sub-groups.

As can be seen, significant correlations were found with the Gestalt, Originality, and Involvement judgements on Art Works 1 & 2 and the Originality and Elaboration Totals of the TTCT. The Spontaneous judgement was not found to correlate significantly in the All Subjects group, though significant correlation was found in the case of 1st Year Males (probably only in 1st Year Form 1).

Few significant correlations were found for 1st Year Form 2, and few, compared with those found for 3rd Year Subjects, for 1st year groups as a whole; though in the 1st Year Group the correlations with the Elaboration scores were similar to those found in the 3rd year. These 1st Year correlations apparently were due to Form 1 Males. This 'overall pattern' was also found in the sub-test Activities of the TTCT. The analysis shown in Table 8:1A revealed the distribution pattern of the significant correlations.

Few correlations were found with the TTCT Originality factor in Activities 1 and 2.

A negative correlation between the TTCT Originality Act 1 and Spontaneous Art Work 2 was found in the 3rd Year Form 2 Females group. Another negative correlation (also significant, though only at  $p \leq .05$ ) with Spontaneous Art Work 2 was found with the TTCT Act. 3 Elaboration in the 3rd Year Form 2 Males group.

One further negative correlation was found in the TTCT Act 1 Originality with Involvement Art Work 2 in the 3rd Year Males group; this was significant ( $p \leq .01$ ) in this group but did not appear in any significant form in any other group. As has been noted the All Subjects, Total Originality correlation between the TTCT and Involvement Art Work 2 was positive and significant at the .01 level.

Tables of the actual correlations between TTCT Activities 1, 2, and 3, and Totals on the Art Works 1 and 2 are given in the Appendix (Appendix Tables

1a-1e, pp 113-115) for the following groups:

- 1a All Subjects
- 1b 1st Year Subjects
- 1c 3rd Year Subjects
- 1d Male Subjects
- 1e Female Subjects

These Tables reveal the low 'r' between the Tests and the Spontaneous Art Works judgements; several negative 'r's' were observed, particularly in Art Work 2 correlations.

Low correlation 'r's' were also noted in TTCT Act 2 Originality and Art Works 1 and 2 Gestalt, Spontaneous, Originality and Involvement.

#### (ii) Correlations: Personality Test and Art Works

The Creativity scores and Extraversion scores of the CPQ/HSPQ correlated with Art Works 1 and 2, Gestalt, Spontaneous, Originality and Involvement in only a few significant cases.

Table 8:2 (next page) shows those correlations that were found to be significant.

No significant correlations were found in the Males, Females or 1st Year Groups.

Art Work 1 Originality was found to correlate significantly with HSPQ Creativity in the 3rd Year Subjects ( $p \leq .05$ ) and in 3rd Year Form 1 ( $p \leq .01$ ). Art Work 1 Gestalt and Involvement also correlated significantly with HSPQ Creativity ( $p \leq .05$ ) in 3rd Year Form 1 group.

Art Work 1 Spontaneous was found to correlate negatively ( $p \leq .05$ ) with HSPQ Creativity and positively with Exvia ( $p \leq .01$ ) in the 3rd Year Form 2 group. This Spontaneous score was also found to correlate positively with Exvia ( $p \leq .01$ ) in the 3rd Year Form 2 Females group.

In Art Work 2 only the Gestalt judgement was found to correlate with the HSPQ; positively with Crea.  $p \leq .05$  in the All Subjects and 3rd Year groups;  $p \leq .01$  in the 3rd Year Form 2 Females group. In this last group Gestalt Art Work 2 correlated negatively ( $p \leq .05$ ) with Exvia.

TABLE 8:2 CORRELATIONS, CPQ/HSPQ AND ART WORKS

CPQ/HSPQ Creativity and Extraversion; significant correlations with Art Works 1 and 2, for those groups where such correlations are found.

Code as for Table One. (p.149)

GROUPS	CPQ/HSPQ ART WK.1		CPQ/HSPQ ART WORK 2.	
	CREA	EXVIA	CREA	EXVIA
All Subjects			G	
3rd Year Subjects	O		G	
3rd Year Form 1	G O I			
3rd Year Form 2	-S	<u>S</u>		
3rd Year Form 2 Females		<u>S</u>	<u>G</u>	-G

TABLE 8:3 CORRELATIONS, CPQ/HSPQ AND TTCT

CPQ/HSPQ Creativity and Extraversion; significant correlations with TTCT. Acts 1,2,3, and Total, Originality and Elaboration.

Code: C - Creativity, E - Extraversion

E C -  $p \leq .05$

E C -  $p \leq .01$

GROUPS	TTCT							
	Act.1		Act.2		Act.3		TOTAL	
	ORIG	ELAB	ORIG	ELAB	ORIG	ELAB	ORIG	ELAB
All Subjects				E				
1st Year Form 2	C	<u>-C</u> <u>E</u>						
1st Year Form 2 Males		<u>E</u>	-C	E	E	E		<u>E</u>
1st Yr Fm.2 Females	C		<u>-E</u>					
Males				<u>E</u>	E	<u>E</u>	E	<u>E</u>
1st Year Females						C		

Appendix Table 2 (Appendix, Table 2 p.115) shows the correlation Matrix for 3rd Year Form 1 as an example.

(iii) Correlations: Personality Test and TTCT

As the Creativity Tests and the Creativity Score of the CPQ/HSPQ are assumed to be measuring the same factor, it was decided that it would be advisable to examine the correlations between these measures in the search for an instrument that would detect creativity; particularly as so few correlations were found between the Art Work judgements and the CPQ/HSPQ.

The correlations of the CPQ/HSP Creativity and Exvia Scores with the TTCT Activities 1,2,3, and Total were examined, and some significant correlations were found.

Table 8:3 (previous page) shows those groups in which the correlations were found.

The majority of significant correlations were found with the Exvia factor, and in the Males and 1st Year Form 2 Males groups in particular. As can be seen from Table 8:3, these correlations were found in TTCT Acts 1, 2, 3, and Total, and mainly with the Elaboration factor.

Correlations of the Creativity score of the CPQ/HSPQ with the TTCT were found in Act.1. Originality in the 1st Year Form 2, and 1st Year Form 2 Females groups ( $p \leq .05$ ). It was also found to correlate with Act 3 Elaboration in the 1st year Females Group ( $p \leq .05$ ). A negative correlation was found between Creativity CPQ/HSPQ and TTCT Act.1. Elaboration ( $p \leq .01$ ) in the case of 1st Year Form 2; and between Creativity CPQ/HSPQ and TTCT Act.2. Originality ( $p \leq .05$ ) in 1st Year Form 2 Males group. This TTCT Originality was also found to correlate negatively with Exvia ( $p \leq .01$ ) in the 1st Year Form 2 Females group.

One correlation between Creativity CPQ/HSPQ and TTCT Act 3 Elaboration ( $p \leq .05$ ) was found in the 1st Year Females group.

In the All Subjects group only Exvia correlated significantly with the

TTCT Act.2. Elaboration ( $p \leq .05$ ).

Appendix Tables (Appendix Tables 3a and 3b, p.116 ) show the correlations for the Males and 1st Year Form 2 Males, as examples of the significant Exvia factor.

#### (iv) Intercorrelations: Art Works

The correlations matrices were examined for all 21 groups to observe the Intercorrelations for the four judgements (Gestalt, Spontaneous, Originality, and Involvement) on the Two Art Works.

Table 8:4 (next page) reveals the pattern found for the All Subjects group. This pattern is typical of that found in many of the other groups. Though fewer intercorrelations were found in the 1st Year Males group, a similar pattern prevailed.

Basically the pattern is that the Gestalt, Originality, and Involvement judgements intercorrelated significantly ( $p \leq .01$ ) in most groups for Art Works 1 and 2.

The Spontaneous judgement either correlated at a lower level - as mentioned in Table 8:4 (see also Appendix Table 4a p.117), did not correlate at a significant level, e.g. in the 1st Years group (see Appendix Table 4b, p.117), or correlated negatively at a significant level ( $p \leq .05$ ) in the Males group (Appendix Table 4c p.118). These Spontaneous correlations were found in the Art Work 2, judgements, though, as Spontaneous Art Work 1 also correlated negatively (not significantly) with Spontaneous Art Work 2, this was perhaps not typical.

Thus the main finding was that Spontaneity did not correlate with the Gestalt, Originality, and Involvement judgement, though significant correlations were found among these three latter judgements.

#### (v) Intercorrelations: TTCT

The correlations matrices were examined for the 21 groups to observe the intercorrelations of the Originality and Elaboration factor scores on the TTCT Acts 1, 2, 3, and Total.

TABLE 8:4 INTERCORRELATIONS, ART WORKS 1 & 2: ALL SUBJECTS.

Art Works 1 and 2, Gestalt, Spontaneous, Originality and Involvement. Intercorrelations; significance levels  $p \leq .05$  and  $p \leq .01$ . x = no significant correlation.

FACTOR		ART WORK 1				ART WORK 2			
		GEST	SPON	ORIG	INVO	GEST	SPON	ORIG	INVO
ART WORK 1	GEST	-							
	SPON	x	-						
	ORIG	.01	.05	-					
	INVO	.01	.01	.01	-				
ART WORK 2	GEST	.01	.01	.01	.01	-			
	SPON	x	.01	x	x	x	-		
	ORIG	.01	.01	.01	.01	.01	x	-	
	INVO	.01	.01	.01	.01	.01	.05	.01	-

Note: .01 means that these intercorrelations for the Spontaneous factor are just significant at the  $p \leq .01$  level. All the other  $p \leq .01$  correlations are significant well beyond the  $p = .01$  level (some in fact at  $p \leq .001$ ; though, as the chosen levels for this study were  $p \leq .05$  &  $p \leq .01$  it was decided not to show other levels in the tables).

TABLE 8:5 INTERCORRELATIONS, TTCT: ALL SUBJECTS

TTCT Acts 1, 2, 3, and TOTAL; Originality and Elaboration. Intercorrelations; significance levels  $p \leq .01$  and  $p \leq .05$ . x = no significant correlation.

	ACT 1		ACT 2		ACT 3		TOTAL	
	ORIG	ELAB	ORIG	ELAB	ORIG	ELAB	ORIG	ELAB
ACT 1 ORIG	-							
ELAB	x	-						
ACT 2 ORIG	x	.01	-					
ELAB	x	.01	.01	-				
ACT 3 ORIG	x	.05	.01	.01	-			
ELAB	.05	.01	.05	.01	.01	-		
TOTAL ORIG	.01	.01	.01	.01	.01	.01	-	
ELAB	.05	.01	.01	.01	.01	.01	.01	-



Table 8:5 (page 156 ) reveals that significant intercorrelations were found among the scores of the three activities and totals of the Originality and Elaboration factors.

The pattern found was typical of the intercorrelations, though in a few groups Originality in Act.1. did not correlate significantly with Originality or Elaboration in Acts.2 and 3.

In the majority of cases the intercorrelations found, although often significant, were of a lower level of significance between the Originality scores and the Elaboration scores in the three Activities and Totals. Thus the significant correlations between the Originality scores are highly significant, and the correlations between the Elaboration scores are highly significant (both well beyond  $p \leq .01$ ), but the correlations between the Originality and Elaboration scores are not as highly significant, though often are significant at  $p \leq .01$ .

Appendix Tables for the All Subjects, 1st Years, and Females groups (Appendix Tables 5a, 5b and 5c. p118-119) indicate the pattern found.

(vi) Correlations: TTCT and MTCT

The correlations of the scores on the three Activities and Total Originality and Elaboration of the TTCT with the three Tasks scores for Originality and Elaboration of the MTCT, were examined.

Table 8:6 (next page) shows the significant correlations found, between the MTCT and the TTCT, in the All Subjects group. The majority of these correlations were found between MTCT Task 2 Elaboration and Task 3 Originality and Elaboration, and TTCT Act 1 Elaboration and Acts 2, 3, and Total Originality and Elaboration.

This pattern was found in the significant correlations in the majority of groups, though fewer correlations were found in the 1st Year and Males groups, and more in the 3rd Year, and Females groups.

TABLE 8:6 CORRELATIONS TTCT AND MTCT: ALL SUBJECTS

TTCT Acts. 1, 2, 3, and Total MTCT Tasks 1, 2, and 3;  
both tests figural form, and scored on Originality and Elaboration.  
Significance levels  $p \leq .01$  and  $p \leq .05$ . x = not significant.

TTCT	MTCT					
	TASK 1		TASK 2		TASK 3	
	ORIG	ELAB	ORIG	ELAB	ORIG	ELAB
ACT 1 ORIG	x	x	x	x	x	x
ELAB	x	.01	x	.01	.01	.01
ACT 2 ORIG	x	x	x	.05	.01	.01
ELAB	x	x	x	.01	.01	.01
ACT 3 ORIG	x	x	x	.01	.01	.01
ELAB	x	x	x	.01	.01	.01
TOTAL ORIG	x	x	x	.01	.01	.01
ELAB	x	x	x	.01	.01	.01

Note: No Totals for the MTCT Originality and Elaboration were used.

TABLE 8:7 CORRELATIONS MTCT AND ART WORKS 1 & 2: ALL SUBJECTS

MTCT Tasks 2 & 3 Originality and Elaboration and Art Works 1 & 2, Gestalt, Spontaneous, Originality and Involvement. (Note: MTCT Task 1 is not included as no significant correlations were found). Significance levels  $p \leq .01$  and  $p \leq .05$ . x = not significant.

	MTCT			
	TASK 2		TASK 3	
	ORIG	ELAB	ORIG	ELAB
ART WORK 1				
GEST	x	x	x	.05
SPON	x	x	x	x
ORIG	x	x	.05	.01
INVO	x	x	x?	.01
ART WORK 2				
GEST	x	.01	x	.01
SPON	x	x	x	x
ORIG	x	.05	.05	.01
INVO	x	.01	.05	.01

Note: x? = nearly significant at .05 level: was significant in previous study (Dissertation for D.A.S.E. Keele Univ.1968).

Appendix Tables for the All Subjects, 3rd Years, and Males groups (Appendix Tables 6a 6b, & 6c p.120-121) show the basic trend found among the significant correlations.

(vii) Correlations: MTCT and Art Works

The correlations for the MTCT and the Art Works were fully reported in a previous study (Williams 1968). As the present matrix correlation method included the correlations of the MTCT and the Art Works, it was decided to examine these to see if the 'drop outs' from the previous study had made any difference in the pattern of correlations found in the previous study.

Table 8:7 (page 158. ) shows the significant correlations that were found. These correlations were basically similar to those found in the previous study.

Fewer significant correlations were found in the 1st Year groups than in the first study.

More significant correlations were found with Art Work 2 than with Art Work 1 in the case of the Females group.

Appendix Tables for the All Subjects, 1st Years, and Females groups (Appendix Tables 7a 7b and 7c p.121-122) show the general pattern that was found.

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## CHAPTER NINE

### DISCUSSION OF RESULTS

In this chapter the results of the analysis of the data are considered in two parts. Part A is concerned with the discussion of the results, and Part B with the conclusions reached regarding Hypothesis A.

#### PART A: Discussion

The results are discussed in the same order as they were presented in Chapter Eight.

#### SECTION 1: Reliability of the Art Work Judgements

As the interjudge correlations were significant (well beyond the  $p \leq .01$  level), except in the case of the Gestalt judgement in Art Work 2, it was decided to accept the Art Work Judgements - Gestalt, Spontaneous, Originality, and Involvement - as reliable.

As had been expected (Chapter Seven, A, the Gestalt Judgement, p.141), the Gestalt Judgement was found unreliable in scoring Art Work 2 (Own Choice) where 'originality' in terms of deviation from the norm was more difficult to judge. It was decided, however, to retain the Gestalt judgement as it appeared reliable in the case of Art Work 1.

#### SECTION 2: Tests and Art Work Relationships

##### (1) Correlations: Creativity Tests (TTCT) and Art Works.

The major finding revealed by the significant correlations of the scores on the TTCT and the Scores on the Art Works was that there was a relationship between them in the case of the Gestalt, Originality, and Involvement Judgements.

There was little relationship found between the TTCT and the Spontaneous Art Work Judgement.

When sub-group correlations were considered, the relationship of the TTCT Elaboration factor and the Art Work Gestalt, Originality, and Involvement Judgements, appeared stronger than the relationship between

the TTCT Originality factor and the three Art Work Judgements. This was more noticeable in the case of TTCT Acts. 1 and 2, than in the case of Act.3; in the 1st Year subjects group, this was also the case in Act.3.

In the case of the 1st Year, as a whole, there were relationships between the TTCT Elaboration factor in Acts. 2, 3, and Total, and the Judgements on Art Works 1 and 2; though fewer significant correlations were found in the 1st Year sub-groups.

The few negative relationships noted in some sub-groups and sub-test correlations did not appear in the main groupings; i.e. All Subjects, 1st Years, 3rd Years, Males and Females. These were thus disregarded.

As there were so many relationships between the TTCT, especially the Elaboration factor, and the Gestalt, Originality, and Involvement Art Work Judgements, particularly in the overall groupings, it was probable that the Tests and Art Works were measuring similar factors.

In the case of the Spontaneous Judgement, little relationship was found. The reason for this is not easy to detect. Probably the fact that the Spontaneous factor was scored as a 'bi-polar' judgement may have contributed in that a 'High Creative' who was also very 'Deliberate' would have obtained a low score.

#### (11) Correlations: Personality Test and Art Works.

In view of the very few correlations that were significant, between the scores on the Personality Test and the Art Work Judgements - Gestalt Art Work 2 ( $p \leq .05$ ) being the only significant relationship in the All Subjects Group - it was apparent that any relationship in this area was at a very low level or non-existent.

There was some relationship in the case of the 3rd Year Subjects, particularly in the case of the 3rd Year Form 1 HSPQ Creativity and Gestalt, Originality, and Involvement (Art Work 1); also Spontaneous (Art Work 1) appeared related to Exvia (HSPQ) in 3rd Year Form 2 Females.

These few significant correlations, however, were not sufficient to prove any real relationship between the Creativity and Extravert factors of the Personality Test and Creativity, as judged in the Art Works. It is possible that those relationships that were found could have occurred by chance.

It was felt that there was no relationship between the Personality Test and the Art Works Judgements, as far as the Creativity and Exvia scores were concerned.

#### (iii) Correlations: Personality Test and TTCT

Though a few significant correlations were observed between the scores on the TTCT and the Creativity and Exvia scores on the CPQ/HSPQ, these were mainly in the TTCT sub-test Activities area.

Creativity was only found to be related to TTCT Originality in Act 1 (1st Year Form 2 Females); it was 'negatively' related in the case of Act 2 (1st Year Form 2 Males). Creativity (CPQ) was found to be related to Elaboration in TTCT Act.3 (1st Year Females).

In the All Subjects Group no relationship between the CPQ/HSPQ and the TTCT Total Originality or Elaboration was found; a relationship was noted between CPQ/HSPQ Exvia and TTCT Act 3.Elaboration.

This Exvia relationship was found in other sub-groups, mainly 1st Year Males and with TTCT Elaboration; though some relationship with Originality was also noted in Act.3. and Total.

Exvia appeared to be the main factor in the Personality test that related to scores on the TTCT. This is of interest, as it has been postulated that 'Introverts' are more likely to be creative than 'Extraverts'. Cattell (Cattell 1963) has stated "In most general terms the creative person is a self-sufficient, introvert."

Not all researchers have found this so however. MacKinnon (1967) found that creative persons could be 'introvert' or 'extravert' and Cross etal (1967) considered that creative individuals may be 'extravert'.

As there were so few relationships between the TTCT and the CPQ/HSPQ in the present study, however, it would be unwise to draw any conclusions in this area.

As there were no significant correlations found, in the main groupings, between the CPQ/HSPQ and the TTCT Totals, no true relationship could be accepted. As in the case of the Art Work Judgements and the Personality Test relationships observed may have occurred by chance.

#### (iv) Intercorrelations: Art Works

The correlations among the Gestalt, Originality, and Involvement Art Work Judgements were highly significant. It was accepted, therefore that there was a strong relationship among these judgements.

The correlations between the Spontaneous judgement, and the three other Art Work Judgements were not significant to the same degree or were not significant at all.

It was accepted, in this case, that there was little relationship between the Spontaneous Judgement and the Gestalt, Originality, and Involvement Judgements.

As mentioned previously, the fact that the Spontaneous factor was treated as a bi-polar judgement may have been responsible for this non-relationship.

#### (v) Intercorrelations: TTCT

The correlations between the Originality and Elaboration factors of the TTCT were significant. These intercorrelations were found in the All Subjects group and sub-groups, for TTCT Acts 2, 3, and Total. In TTCT Act.1. however, the level of correlation between Originality and Elaboration was lower ( $p < .05$ ). This weaker relationship between the Originality and Elaboration factors was typical of their relationship when the actual 'r's' for sub-groups were examined; i.e. the levels of correlation were

higher among the various Originality scores, and the various Elaboration scores, than they were between the Originality scores and the Elaboration scores.

Thus, though a relationship between the Originality and Elaboration factors undoubtedly exists, there is some reason to believe that there is a difference between them.

(vi) Correlations: MTCT, TTCT, and Art Works

The previous study, (Williams 1968) revealed that there was a relationship between the MTCT and the Art Work Judgements. The present study confirmed these findings, though it has revealed that the relationship between the TTCT and the Art Work Judgements is much stronger than the relationship between the MTCT and the Art Work Judgements.

The TTCT is, therefore, likely to be a more suitable measuring instrument, for measuring creativity as judged in the Art Works, than is the MTCT.

The relationship between the MTCT and the TTCT was found to be quite strong, in some sections of the tests. This was to be expected, as they are basically similar in purpose and design; the scoring methods being different to some degree.

The relationships were found to be strong in only half the MTCT Tasks and the TTCT Activities. There was little relationship between the TTCT and the MTCT, where the All Subjects group was involved, where the MTCT Task 1 (Originality and Elaboration), and MTCT Task 2 (Originality) were concerned.

It is difficult to find a satisfactory explanation for this phenomenon. Some explanation may be provided by the fact that the scoring methods of the TTCT Act 1. and the MTCT Task 1 result in a narrow range of scores (MTCT Originality may only be scored 0, 5, or 10, and Elaboration 0, 5, 10, or 15; TTCT Originality may be 0 to 5, and Elaboration 0 - 7x, as points are given for every detail extra), and the validity may be low in consequence



for Originality and Elaboration comparisons, as the scoring methods are not compatible.

Basically, it was felt that as far as Acts 2, 3, and Total (TTCT) and Tasks 2 and 3 (MTCT) are concerned there is a relationship between the MTCT and the TTCT.

### SECTION 3. Further Considerations.

#### (1) Norm Comparisons.

Torrance provides some Norms for comparison purposes in the TTCT manual (TTCT, Norms-Technical Manual, Personnel Press. Inc. 1966 p.60). He gives the Means and Standard Deviations for Grades 1 to 12. These are approximately equivalent to the 1st and 3rd Year groups in the present study, where grades 6 and 8 are concerned. The norms are based on a study involving children in a Californian School System.

TTCT, FIGURAL FORM A, MEANS AND STANDARD DEVIATIONS FOR TOTAL ORIGINALITY AND ELABORATION, FOR GRADES 6 and 8 (Norms for American Children)

Grade	Originality		Elaboration	
	Mean	S.D.	Mean	S.D.
Sixth	28.3	10.9	47.9	18.5
Eighth	29.6	12.2	68.4	29.5

TTCT, FIGURAL FORM A, MEANS AND STANDARD DEVIATIONS FOR TOTAL ORIGINALITY AND ELABORATION, FOR 1ST AND 3RD YEAR SUBJECTS INVOLVED IN THE PRESENT STUDY (Rural Secondary School Children)

Grade	Originality		Elaboration	
	Mean	S.D.	Mean	S.D.
1st Year N.45	24.60	10.39	58.37	25.05
3rd Year N.41	34.75	12.65	68.61	25.35

As can be seen from the above table of comparisons, the Norms given by Torrance appear fairly similar to those found in the present study.

No Norms were available for the CPQ/HSPQ for different Grades, in the Creativity factor. Ipat Bulletin No.10 does state, however, that an average

score on creativity for the HSPQ (i.e. used by 3rd Years) is 66, and the Exvia average score (IPAT, Handbook for the HSPQ, 2nd Ed.1962) is 38.5.

The Means for the All Subjects group, in the present study, were: Creativity:- 63.2, and Exvia:- 33.2. Thus the Creativity score and Exvia score in this study are slightly lower than average means given. Means for the 3rd Year Subjects (who used the HSPQ) were: Creativity - 64.4, and Exvia 36.8. For the 1st Years (who used the CPQ) the Means were: Creativity- 62.1, and Exvia - 29.9.

The Creativity and Exvia Means in the present study were therefore similar to averages given for the CPQ/HSPQ.

The Norms and Means for the Creativity Tests and the Personality Tests were derived from studies based on American children. Whilst there were similarities observed between the Norms and Means of the American studies and the Norms and Means obtained by the Rural Secondary School children in the present study, it is not possible to state that these Norms and Means are in any way representative of the total British Secondary School population. It is possible that they may be representative, but studies with different groups and larger groups would be necessary to establish such a relationship.

#### (ii) 1st Year Correlations

The lack of significant correlations, in some of the 1st year groups involved in this study, between the TTCT Originality score and the scores on the Art Works, was puzzling.

There appeared to be no reason for this. The same methods for scoring the Tests and the Art Work were used for the 1st and 3rd Year subjects.

It is possible that the Art Work Judgements were not capable of measuring 'creativity' in the 1st Year groups in the same way they were in the 3rd Year groups; though no evidence could be found that would confirm this theory, or the possibility that the TTCT may act in the same way where visual production was concerned.

NOTE: As it was probable that the TTCT, as a result of this study to test Hypothesis A, would also be used as a 'post test' instrument in testing Hypothesis B, it would be possible to compare the correlations of the 1st Year groups (in the present study) with their correlations when they became 3rd years (in the study to test Hypothesis B), to observe if the same pattern occurred.

It was decided to adopt this procedure, and report, briefly, the results of this correlation as a 'further consideration' in the Study to test Hypothesis B.

## PART B. CONCLUSIONS

In this study to find a measuring instrument that could measure 'creativity' in the visual field, the following were the findings from which conclusions could be drawn:

- 1) The Art Work Judgements were, on the whole, reliable.
- 2) There was a strong relationship between the Torrance Tests of Creative Thinking (Figural Form) and the Art Work Judgements.
- 3) There was little evidence of any relationship between the Personality Tests (CPQ/HSPQ Creativity and Exvia scores) and the Art Work Judgements. The same was true for the relationship between the Personality Test and the Creativity Tests (TTCT).
- 4) Relationships were found among the factors of the Creativity Test; and also among the Art Work Judgements, with the exception of the Spontaneous Judgement.

From these findings, the following conclusions were reached: The Null Hypothesis for this study was "There is no relationship between creativity measures and creativity judgements of visual productions." The major conclusions concerned with the testing of this hypothesis were:

- 1) As a strong relationship was observed between the Torrance Tests of Creative Thinking (Figural Form) and the Art Works Judgements for Gestalt, Originality, and Involvement, the Null Hypothesis was, rejected in this area.
- 2) There were relationships among the factors of the TTCT and among the Judgements of the Art Works. There is a probability, therefore, that

some underlying factor is being measured in each case.

The Spontaneous Art Work Judgement did not bear any relationship to the other Art Work Judgements, or to the TTCT factors; there were, however, reasons to suspect the validity of this judgement. The Originality and Involvement Art Work Judgements were reliable, and strongly related. The Gestalt Art Work Judgement, though relating to the Originality and Involvement Judgements, was reliable when scoring work produced when subjects worked on the same problem (i.e. the 'set' subject), but less reliable when they worked on themes of their own choice.

- 3) There was no relationship between the Personality Tests and Creativity, as measured in the Art Work Judgements; the Null Hypothesis was, therefore, accepted in this area.

The main conclusion was that 'Tests of Creativity can, to a large extent, measure creative ability in the visual field.'

The Torrance Tests of Creative Thinking (Figural Form) was probably the most suitable measuring instrument tested in that it was easily administered and scored, suitable for testing groups of children, and it was economic and easily available.

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## PART THREE      DEVELOPMENT OF THE CREATIVITY PROGRAMME

### CHAPTER TEN

#### PREPARATION AND CHOICE OF RELEVANT FACTORS

The choice of factors involved was considered in three sections:

A. The literature was examined for factors that appeared relevant to the problem area, B. the subjects, for whom the programme was intended, were considered, and C. the factors found in the A and B sections were examined analytically; those suitable for inclusion in the programme were chosen. This chapter, therefore presents the choice of factors in those three sections.

#### SECTION A   EXAMINATION OF RELEVANT LITERATURE

From the Review of Literature two main areas were examined:

1) CREATIVITY, and 2) PROGRAMMED INSTRUCTION.

##### 1) CREATIVITY

The work involved in the Review of Literature was major 'preparation' for evolving the Creativity Programme. Though only a proportion of the work found its way into the final review, that proportion consisted of the literature considered relevant to the problems of testing and increasing creative activity.

The general definitions of creativity (pp.14-16) revealed that the main factor likely to be involved in any attempt to increase creativity was that of 'originality'. Coupled with this factor was the proviso that new, original, unusual productions must be 'relevant' to the situation in which they are created; i.e. productions must be rational in context of the problem solution.

MacKinnon (1967) gave a third condition (p.15 ); that of 'elaboration', where he stated that a creative idea should be developed to the full.

The problem of creating a Creativity Programme was, therefore, concerned basically with increasing 'originality', that was 'relevant', and fully realised.

As was stated in the review itself, the factors involved in the area of creativity fall into three main sections: a) The Creative Person, b) The Creative Process, and c) The Creative Product.

The factors, that were considered relevant to the development of the Creativity Programme, are now listed in these three main sections.

#### a) The Creative Person

A great number of traits, characteristics, factors, etc. concerning creative persons were noted in the Review of Literature. Much of the terminology used in defining factors, traits etc. tended to increase the number of such traits, as a number of terms tend to define similar traits.

A selection of some of the traits, that have been found to be typical of the creative personality, was formed. These are listed here under the trait or factor name. The full definitions were given in the Review of Literature (pp.16 - 25).

The traits selected were found to fall into two main groups: i) Those traits that are socially unacceptable or undesirable, and ii) Those traits that are socially acceptable or desirable. The lists that follow are therefore presented under these two headings:

##### i) List of Traits that were considered Socially Unacceptable

Undisciplined, Rebellious, Anti-Authoritarian, Childish, Crazy, Anxious, Aggressive, Rude, Disruptive, Argumentative, Complaining, and Fault finding.

This selection of traits found in creative persons is more typical, perhaps, of the view of the observer of creative persons than of the creative person's concept of himself.

There is no doubt however, that creative persons often do exhibit behaviour that is indicative of the existence of some of the above traits.

It is also probable that some socially unacceptable traits of this nature are evidence of an underlying bi-polar factor. E.g. the effect of such a factor might be to produce 'fault-finding' behaviour at the socially

unacceptable pole, and a 'questioning' constructive attitude, associated with creative solutions, at the socially acceptable pole.

Many of these 'unpopular' traits, as Maslow (1962) pointed out (Review of Literature p. 23 ), pertain more to the formative stages of the creative personality than to behaviour in the mature creative. For this reason, they are more often noticable in the behaviour of children.

#### ii) List of Traits that are considered Socially Acceptable

There were many traits found in the Review of Literature that were socially acceptable or desirable, or at least not unacceptable. The list that follows is a sample of these traits; particularly those that appeared to be relevant to the problem.

They are presented in the groups of what were considered similar, or related factors.

The factor of 'intelligence' was considered at length in the Review (pp.17-19), and, in view of the controversy concerning 'creativity v intelligence', the author tends to accept the view put by MacKinnon (Review of Literature p. 19 ), when he stated "... above a certain required minimum level of intelligence,... being more intelligent does not guarantee a corresponding increase in creativeness. It is just not true that the more intelligent person is necessarily the more creative one." It is accepted, however, that the very creative individual is, usually, also very intelligent.

The remaining traits selected are listed in the nine groups, as considered in the Review of Literature.

1. Questioning; Sensitivity to Problems, Evaluative, Critical, Self-Critical, Perceptive, also associated with this group were the traits, considered undesirable, of complaining and fault-finding.
2. Adventurous, Not Afraid to Take Risks, Progressive, Open to Experience, and Venturesome.
3. Versatile, Fluent, Divergent, Likes Variety, and Flexible.
4. Persevering, Committed, Involved and Determined.

5. Contemplative, Imaginative, Inventive, Plays with Ideas, Introverted, Dreamer (i.e. Day-Dreamer)
6. Individualistic, Independent, Self-Sufficient, Autonomous, Unconventional, Non-Conformist, i.e. Prefers own Ideas to Popularity.
7. Humorous. Sees the 'Funny' side of things.
8. Emotional, Sensitive, Empathic, and Tender-Minded.
9. Energetic, Industrious, Dynamic, and Vital.

Though there may be some doubt as to the 'social acceptability' of all these traits, in all types of 'society', they are probably acceptable in any society that values creative activity.

#### b) The Creative Process.

The factors, revealed in the Review of Literature, involved in the process of creation are seen more easily if the 'four stages of creative process', adopted by Wallas (1926), are used as headings in the list of factors. As they were also discussed in a similar way in the Review of Literature (pp. 25 ), this aids reference.

The four stages that Wallas described are; Preparation, Incubation, Illumination, and Verification. As previously stated, these stages do not of necessity occur in this order, or in water-tight compartments, in the actual creative process. The stages may well flow together or change positions several times in the process of creating a product; much depends on the type of creative activity involved.

The four stages are used as headings for the lists of activities and processes that follow.

#### Preparation

Preparation, to a certain extent, depends upon the personality of the creator. The development of the personality can thus be regarded as 'preparation' for creative activity. The list that follows, however, is confined to those activities that can be consciously applied in preparation for creative activity.



As was found in the Review of Literature (pp.26-28) this preparation can involve:

Mastering Accumulated Knowledge, Gathering New Facts, Observing, Exploring, Experimenting, Developing Techniques and Skills, Sensory Experiences, Discrimination, Recognizing Problems, Analysing Problems, Observing Needs, Analysing Needs, Surveying All Information, Obtaining Information and Experience from a Variety of Fields, Fact-Finding, Defining Problems, Gathering Pertinent Data, Questioning, Discussing, Mastering Techniques, Mastering Media, and becoming Immersed (Deeply Involved) in the subject.

The act of 'Finding the Problem' is one of the most important preparatory processes. As Einstein remarked (Review of Literature p. 27 ) "The formulation of a problem is far more often essential than its solution, which may be merely a matter of mathematical or experimental skill." Though many creative acts are more than mere skill', particularly in the case of the 'Fine Arts', there is much truth in this preparatory 'problem sensing' or 'problem defining'.

Other activities that are obviously involved in the process of creation are implied rather than stated. Preparation such as data recording, in terms of notes, films, drawings, tape-recording, etc. is essential, but is not often stated as such in considering the preparation stage. It is unlikely that such 'preparation' would be assumed as essential by children, unless they are told that it is.

Much of the preparatory work listed above can be classified under the six headings proposed in the Review of Literature (p. 28 ), i.e. Sensory Collection, Experimentation, Skill Development, General Research, Particular Research, and Recording of Information,.

Mastery of the Subject and Mastery of the Media, are probably major factors in the preparation for high level creative activity.

## Incubation

This stage was considered to be the vital stage concerned with the actual process of creation, from the instructional point of view. A considerable amount of the literature reviewed (pp.28-30 ) revealed that 'subconscious activity' was considered an important part of the incubatory stage. As such postulated subconscious activity was not likely to be controllable in an experimental situation, the lists of creative processes that follow were chosen with conscious activities in mind: though some processes do imply activity that is not immediately observable as conscious activity.

The following is the list of activities that were considered as 'creative processes' in the Incubation stage:

Associative, Combinative, Building, Serendipity (accidental discovery), Chance, (controlled: e.g. picking two or more ideas out of a 'hat' and combining), Daydreaming (abstract thought, doodling, playing with ideas, etc.) Mediation, Synthesis, Brainstorming, Synectics, Boundary Pushing, Integration, Trial and Error, and, though less certainly, Regression (i.e. Regression in the Service of the Ego).

## Illumination

The stage of 'Illumination' is not strictly speaking an actual process. It is the 'realisation' that the processes in the previous stages have led to a solution of the problem. This is often a 'sudden' realisation, and an element of 'surprise' is often associated with this suddenness.

In the Review of Literature 'Illumination' was described in two statements:

Youtz (1962) stated "New solutions usually appear 'whole'." and Poincare referred to the "...appearance of sudden illumination"

These remarks describe the main facets of the appearance of the solution: it was upon the concepts of the 'suddenness' and the 'wholeness' of problem solutions that the concepts of 'unconscious thought processes' were adopted.

Beyond admitting some validity for the concept of the stage of 'illumination', there is little to add that is relevant as far as instruction in the present study is concerned.

### Verification

The important stage of verification is basically the testing of the validity of the solution, coupled with the process of elaboration.

It was found difficult to accept this stage as only occurring at the conclusion of creative activity: it is almost certainly a process that accompanies many of the other processes in the first two stages. It may be that it is the actual act of verification, in the mind at least, that results in the 'Illumination' stage.

The following list is comprised of a few of the processes that came under the heading of 'verification':

Testing, Criticizing (Self-Criticizing), Evaluation, Elaboration, Testing Consequences, and Decision Making.

Taylor (1967) referred to 'Deliberate Effort (Verify, Elaborate, Revise)'. Revision, of course, can lead to further creative activity.

Rogers (1954) considered that it was the 'internal evaluation' that satisfied the 'inner requirements' of the creator; however, as in many cases evaluation must depend upon 'external' judges or a product may never be actually produced, for the purposes of instruction 'observational criteria' must be used.

The process of verification will depend, to a large extent, upon the type of creative product involved. The criteria for such an evaluation must be concerned with judging the final product of creative activity.

### c) The Creative Product

As was observed in the Review of Literature (pp.33-38) there has been little research concerning criteria for judging creative products. As Brogden and Sprecher stated "Despite the fact that products lie at the heart of criterion problems, little work has been done with them ..."

The list of criteria that were chosen were based on those few researches that were reviewed. These criteria were often concerned with 'art judgements', but a number of such criteria were found likely to be applicable to the judgement of other products.

The following list of criteria is classified under eight headings based on suggested criteria in the review (p. 39 ). Creative products should reveal:

1. Originality

Newness, Improvement on Previous Products, Extension of Limits, Novelty, Innovation, Unpredictability, No Precedents, and an Element of Surprise.

2. Dynamism

Vitality, Vibrancy, Interest, Movement, Excitement.

3. Complexity

Richness, Fullness, Elaboration, Variety, Sophistication, and Contrast.

4. Integration

Unity, Economy, Organization, Conservation, Elegance, Interaction, and associated at this point is the concept of 'Gestalt': i.e. 'the whole being greater than the sum of the parts.'

5. Personality

Shows the 'Stamp' of the creator, Expression of 'Mood', Expression of Self, and Personal 'Style'.

6. Changes the Environment

Changes way of life, Adds to the quality of life, as Ghiselin expressed it, a product should be judged by the "Extent to which it restructures our universe of understanding."

7. Mastery of Media

Use of materials, Skills in handling, or Designing for, Methods of Production; Unusual use of Media.

8. Mastery of the Subject Area

Evidence of knowledge of the area, environment, etc, in which the

creative activity occurs. Involvement in the 'history' of the subject - has not repeated past productions, or made mistakes previously made.

A further criteria, and one which is vital to all judgements of creative products, was that a creation must be 'relevant' to the problem. A product must 'do the job', to be 'fit for the purpose' for which it was created.

## 2) PROGRAMMED INSTRUCTION

Prior to examination of Programmed Instruction methods, consideration was given to methods for increasing creativity that were not programmed. Various direct methods of increasing creativity were examined in the Review of Literature (pp.75-85). Many of these methods were extensions of, or conscious attempts to improve, the processes involved in creative activity.

A number of these methods were considered for possible use in the area of Programmed Instruction: particularly in the classroom situation. The methods considered are listed as follows:

Associative Processes, Synectics, Brainstorming (see also pp.77-82 ), Deferred Judgement, Check Lists, Forced Relationships, Buzz Group Method, Enquiry Training, Trigger Symbol, Lateral Thinking. Arnold's Programme for Personal Development (Review of Literature p. 63 ), and Torrance's list of Twenty Methods for Encouraging Creative Thinking (Review of Literature p. 64 ).

Less direct, 'environmental' or 'transfer training' methods of increasing creativity in general terms were also examined in the Review of Literature (pp.65-69 ), but as these methods were not particularly relevant to the present study, they were not chosen for listing at this point. Some, however, were kept in mind; such as the remarks made by Kneller (Review of Literature pp.65-66 ) concerning the school environment.

Suffice it to state, that an increase of general creative ability would be likely to occur if environmental conditions at home, school, and work could

could be organized in some of the ways suggested.

Some studies of methods concerned with increasing creative activity in the 'visual arts' were reviewed (pp.69-75 ), but, as was pointed out, there was little in the literature on the visual arts specifically directed to increasing 'creativity' itself. The work of Lowenfield, Burkhart and associates was to a certain extent, exceptional in this respect.

The range of Programmed Instructional methods was examined in three areas. The lists of methods, that appeared possible or relevant for use in the present study, are presented under the three headings, a) Classical Methods, b) Developing Techniques, and c) Programmed Instruction and Creativity.

#### a) Classical Methods

From the brief review of the work of the pioneers of Programmed Learning (pp.87-88 ), the following techniques were chosen for consideration in developing the programme:

Linear; Skinner's steps in a linear programme were used as a 'take off point', i.e. the concept of 'Logical Sequence, Small Steps, Active Response, Immediate Knowledge of Results, Self Pacing, plus Evaluation, Branching; Intrinsic programming as developed by Crowder.

Ideas concerning these methods, as developed by Mager, Gilbert, and others: e.g. Sequencing, and Learner Based Programming.

#### b) Developing Techniques

From the Review of Literature (pp.89-100) the following concepts were considered :

Self-Pacing - criticisms regarding time factor in classroom, group instruction, work in pairs and individual work.

Immediate Knowledge of Results (KR) - much argument and confusion found regarding ideas of motivation and re-inforcement.

Active, Overt Response - controversy noted here, but some 'overt' active response is generally accepted as desirable in most cases.

Small Steps or Frames - most recent work appeared based on concept of 'optimum step size'. Kay, Dodd & Sime (1968) stated (Review of Literature (p. 95 ) "A frame is a UNIT of presentation which makes you think or act.", and Rowntree (1966) considered (Review of Literature P. 95 ) that the material should be challenging and not too easy.

Logical Sequence - This concept led to a number of questions, and many methods were devised in attempts to answer them. The main questions were: 'What is a logical sequence?', and 'To whom is it logical?' Mager and Gilbert, as mentioned above suggested some methods of answering these questions. More recently researchers like Gagné and Davies (Review of Literature pp.97-98 ) have developed methods of Task Analysis, and shown the importance of analysing the 'objectives' and stating them clearly. The methods of Task Analysis described by Davies (pp.97-98) were considered in this area; including Flow Diagrams, Matrix Analysis, Logical Trees (particularly useful 'on the job'), and Algorithms.

Evaluation - Testing the efficiency of programmes, in their development and in the 'field'. The importance of the 'target population' in this respect. Methods of evaluating research experiments were also considered. The work of Davies, Hartley, and Stolurow (pp.98-99) was found useful in this area.

Other developments also considered were: Adjunct Programming, Structural Programming and Structural Communication (Review of Literature p. 100 ).

### c) Programmed Instruction and Creativity

The Review of Literature revealed (pp.101-7) that only a few attempts had been made - up to 1968 - to increase creative ability using Programmed Instruction. The main programmes that had been developed and tested were: Crutchfield's 'Productive Thinking Programme', Myers and Torrance 'Idea Books' and the 'Imagi Craft' programmes, the 'Purdue Creativity Programme',

and the recent Programmed Instruction methods used by Shackel and Lawrence (1969). As a result of the consideration of these methods it was decided to develop a creativity programme.

## SECTION B SUBJECTS AND ENVIRONMENT

This section was considered in two parts: The Subjects and their own environment, and the school environment in which the subjects worked.

### 1) The Subjects and Their Environment

The subjects involved in the study were pupils of a rural secondary school in the centre of England.

They were males and females from the villages and farms spread over a wide area; with little contact with city life. Some children went to the local market towns with parents or relations.

Their background was mainly concerned with 'earning a living'. Making money was probably the most important factor in their lives; 'culture' only reached them through TV, magazines, etc. A few children went to local cinemas, and one or two had been to the theatre.

In the main, however, their interests were concerned with farming, earning a living, and interpersonal relationships in their villages. Many had to work on the farm in their 'spare' time.

They were, of course, involved in any current peer group activities and interests; pop music, football, motor cycles, etc..

They were basically cheerful, and had, generally speaking, a well developed sense of independence.

The range of intelligence was wide; IQ's ranged from below 70 to about 120.

The subjects were some of those that had been involved in the study to test Hypothesis A. They had, therefore, been tested for their creative ability when they were first year pupils. The intention being, provided the creativity tests were found to be valid, to test them again when they were third year pupils, following the administration of the Creativity programme.



All the pupils of the original first year intake would be used for the study involving the programme.

## 2) Environment in which the Subjects Work at School

The School was the normal type of secondary school, catering for those pupils who had not 'passed' the 11+ selection examination.

The building included classrooms and subject rooms. The pupils moved round the school from room to room according to the timetable. Lessons were of one or two 'Periods' duration. Periods were of 35 or 40 minutes time.

The intention was to administer the programme in the 'art room' during normal art lessons; using single and double periods where required.

There were two factors involved in making this decision; firstly it was desirable to keep the administration of the programme in as 'normal' a situation as possible, and secondly, the timetable arrangements could not be changed without causing disruption to other school activities, this of course, was not desirable.

As a certain amount of 'art theory' was usually part of the curriculum, design, architecture, colour, aesthetics, etc., a programme such as was intended would not be unacceptable to pupils as completely different from anything that they had done before. Though they would not, of course, have encountered the particular content or presentation previously.

Some attempts to increase creativity in the subject's art work were a normal part of the curriculum. Such tactics as an informal atmosphere, exhortations to be 'Original', to express their own feelings and experience, etc. were part of the normal 'art lessons'.

A wide range of media was used by the pupils. The bulk of two dimensional work involved drawing, collage, and painting; much of this was performed using the medium of 'colour cakes' (i.e. opaque paint of the 'poster' variety), and applied normally with brushes. The subjects were encouraged, however, to experiment with various media and to mix media.

Normally the subjects are reluctant to try 'new' things.

The intention was that the Creativity Programme should be used as an adjunct to the normal classroom work.

The 'art' subject classroom itself, was comfortable, light, and, unless games were taking place on the yard or playing field outside the windows, little distraction was likely to occur.

### SECTION C ANALYSIS OF THE PROBLEM: CHOICE OF FACTORS

As any increase in creative ability was likely to occur by altering the 'thinking' processes of the subjects involved, it was decided to analyse the 'process of creation' first.

Following from this the 'evaluation of the product' appeared as an essential part of the process; this was considered next.

The third and last, part of the analysis was concerned with the 'creative person', in an attempt to define, simply, the type of person who was creative. There was no intention to effect any radical change in the personality of the subjects.

Mention should be made at this point that the analysis of the problem was made as objectively as possible. The eventual aim was to devise the programme; but during the analysis programming concepts, ideas, etc. that came to mind were disregarded, though it was impossible, of course, not to have the general aim at the back of one's mind.

The analysis is presented in three sections corresponding to the above mentioned areas.

#### 1) THE PROCESS OF CREATION

The analysis of the 'creative process' was considered in three stages:

a) The Creative Process: An Overall View, b) The Four Stages of the Creative Process, and c) Selection of Processes that Might be Improved by Instruction.

##### a) The Creative Process: An Overall View

A chart was devised that illustrated, using 'decision tree' methods,

the factors involved in 'creative problem solving'. This chart (page 184) (Table 10:1) revealed that, basically, the decisions made in creative problem solving were little different from those involved in any problem solving decisions. The 'processes' involved were found to be different, of course; three of these processes, found central to creative problem solving, were selected as examples of activities found in the 'creative activity to solve the problem' block in the chart. These are expanded in Table 10:2. These processes were considered the most usual creative problem solving activities.

As can be seen from the chart (Table 10:1) the total problem solving process is complex and interacting.

#### b) The Four Stages In the Creative Process

The chart (Table 10:1) revealed that, in spite of interaction and overlapping, the Four Stages in the Creative Process - as proposed by Wallas and as examined in Section A (pp.172-4) - can be detected. These four stages, Preparation, Incubation, Illumination, and Verification, were thus selected as a model for the analysis.

The whole of the activity involved in solving problems, including 'Illuminations' that ultimately were not 'verified', was regarded, to a certain extent, as Preparation; in that such knowledge is stored in the 'experience store' of the creator. However, for simplification of the analysis for instructional purposes, it was found less confusing to regard each stage as a separate entity.

Incubation was regarded as the stage in which it was most likely that instructional influence could be effective in increasing creativity.

Table 10:2 showed three methods of arriving at creative solutions to problems; i.e. Brainstorming, Combination, and Serendipity. Many more creative processes were noted, of course, in the Incubation stage.

The idea of Illumination was accepted, and thought likely to prove of 'interest' to the subjects, for instructional purposes.

TABLE 10:1 FACTORS INVOLVED IN CREATIVE PROBLEM SOLVING

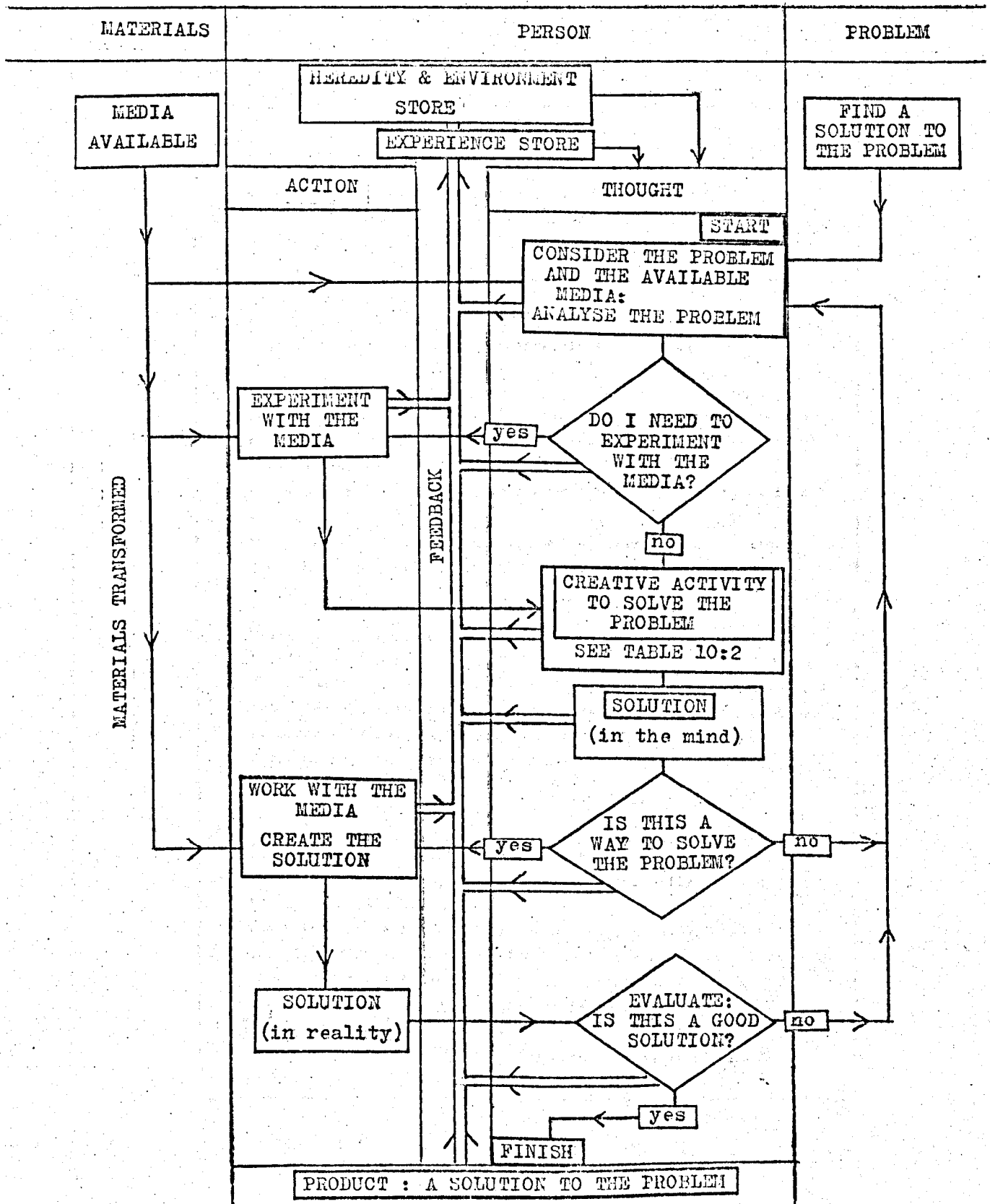


TABLE 10:2 CREATIVE ACTIVITY TO SOLVE THE PROBLEM

SOME CRITERIA FOR CREATIVE PROBLEM SOLVING

1. The problem should be solved in a creative way: i.e. the solution should be Original, New, Unusual, Surprising etc.
2. The Solution must solve the problem set: i.e. it must be Relevant.
3. The final Solution should be in a form capable of being tested or Evaluated.

SOME METHODS OF ACHIEVING CREATIVE IDEAS

Note: Preparation in conscious terms, as well as drawing on the total Personality and Experience, is essential.

1. BRAINSTORMING

Use of Fluency and Flexibility, Withdrawal of criticism at the first stage. Thinking of as many solutions as possible in a set time, and as many different solutions as possible. The solutions need not be considered for practicability at this stage.

The ideas must be recorded: e.g. write, draw, tape, or film.

This method can be used by one person, in pairs, or groups.

2. COMBINATION

Mixing ideas to produce unusual ideas. The work of other persons is often useful as a 'springboard'.

The ideas may come from any type of work; not only the field in which the problem is normally considered. Combinations of ideas from the Arts and the Sciences may occur.

Take the ideas of others and see how they can be combined, changed or adapted.

3. SERENDIPITY

The use of 'accidental' findings: either those that just happen whilst doing other work, or those that occur while 'playing' with ideas, materials etc.

The mind must be 'prepared' in such a way, however, that it is capable of 'seeing' that the 'accident' is a solution. This is a slow and uncertain method of creating solutions.

One method of utilizing Serendipity is to put numerous ideas, facts etc. 'in a hat' and draw them out in pairs, threes, etc. to see if something 'clicks' in the mind when particular combinations occur.

The concept of 'Verification', or evaluation, though coming at various points in the creative process, was regarded, initially, as being the last stage in the creative process. As will be seen later (Chapter 11) this position was accepted in theory, but rejected to a certain extent for instructional purposes.

### c) Selection of Processes that Might be Improved by Instruction

Examination of the literature revealed that a number of processes, that might possibly be improved, were involved in the preparatory and incubatory stages.

Preparatory processes may be short term or long term and therefore not so amenable to programmed instruction. Such processes, however, as Mastering Knowledge of Subject and Media, Experimenting, Using the Senses, Researching, Developing Skills, Questioning, Studying other Creative Work, and recording information, were selected as possible processes that met the criteria previously stated, i.e. Sensory Collection, Experimentation, Skill Development, General Research, and Recording of Information.

The Incubatory Stage, as has been noted in the Review of Literature was the stage most concentrated on with regard to 'processes'. In spite of this fact, there were only a few processes not based on sub-conscious concepts.

The processes selected for possible improvement in creative ability therefore were:

Association, Combining, Building, Serendipity (doodling, day dreaming, playing with ideas), Brainstorming, Integration, and Synectics.

## 2) EVALUATION OF THE CREATIVE PRODUCT

The evaluation of the creative product and the criteria for such judgement was considered in three sections: a) The Importance of Evaluation, b) Criteria for Evaluation, and c) Selection of Possible Criteria.

### a) The Importance of Evaluation

The chart (Table 10:1) revealed that the act of Evaluating the product of creative activity is one of the most important parts of the process itself; i.e. it is only by judging the product that the creator can decide whether it is creative and relevant or not. After 'Illumination' takes place and the idea, where necessary, has been realized in a testable form, Evaluation is the critical stage in the creative process.

### b) Criteria for Evaluation

The examination of relevant criteria showed that work in this area was sparse.

The following list of criteria was considered from the point of view that they could be judged in a reasonably positive way by the subjects. The list was based on the eight categories of evaluating creative products developed in Section A, plus the criterion of 'relevance':

#### 1. Originality

New, or an improvement, Inventive, No Precedent, Element of Surprise.

#### 2. Dynamic

Vital, Exciting, Interesting.

#### 3. Complex

Rich, Elaborate, Full, Shows Variety.

#### 4. Integrated

Unified, Organized, Interacting, Elegant.

#### 5. Personality

Shows the 'Stamp' of the creator, Expression of Mood or Emotion, Personal 'Style'.

#### 6. Changes the Environment

Changes, or adds to, the way of life.

#### 7. Mastery of Media

Knowledge of, and Skill in Using, Media and Methods, Innovative use of Media.

## 8. Mastery of Subject

Knowledge of Immediate Area, and other Areas, that leads to 'new' concepts in the problem area. History of Previous Creative Work in the problem area.

### c) Selection of Possible Criteria

From the above list it was decided to use the headings of the categories as the Criteria for Evaluation that could be used for instructional purposes.

Therefore, the main criteria chosen for Evaluating a Product as Creative were:

Original, Dynamic, Complex, Integrated, Personality, Changes the Environment, Mastery of Media, Mastery of Subject, plus the criterion of Relevance.

It was thought probable that only in a very creative product would all the criteria be positively identifiable.

### 3) THE TYPE OF PERSON WHO IS CREATIVE

The Chart (Table 10:1) revealed that total 'personality', in terms of Heredity, Environment, and Experience, is an important factor in the creative syndrome. The Examination of Relevant Literature pointed out that an enormous amount of work has been done in this area.

The Creative Person has been found to be complex and not easily detectable.

The analysis of the creative personality was considered in three sections a) The Selection of Psychological Traits, b) Observable Factors: Socially Unacceptable & Socially Acceptable, and c) Selection of Observable Traits that may be suitable for instructional purposes with the subjects involved.

It was not the intention, of course, to attempt to change the personalities of the subjects involved; but only to give them a view of what creative persons were like.



### a) Psychological Traits

In the Examination of Relevant Literature, a number of traits were listed that were found, by various investigators, to be typical of the creative person.

Some of these traits were detectable and measurable by the use of instruments such as 'personality inventories', questionnaires, etc., Little correlation, in general, has been found between scores obtained using such instruments and scores on 'creativity' tests. A few studies, as was mentioned in the Review of Literature, did show some correlations, however.

The essential factor when choosing personality traits that were to be used for instructional purposes, was that the traits should be 'observable'. It was also considered that such traits selected should be, as far as possible, 'socially acceptable'.

A list of unacceptable and acceptable traits was given in Section A (p. 170 ). A number of these were observable and were considered in detail for their suitability.

### b) Observable Factors

#### (i) Socially Unacceptable Traits.

The possibility of including traits thought to be anti-social in an instructional programme was considered. Eventually it was decided not to include such observable traits as: Rebelliousness, Undisciplined, Aggressive, Rude, Slipshod, Argumentative, etc., for obvious reasons.

Some similar traits appeared under more socially acceptable terminology in the list in Section A (p.171 ), i.e. 'Rebellious' comes under the 'anti-authoritarian' or 'independent' classification.

It was decided to avoid mentioning names of observable traits that had distinct 'anti-social' connotations.

#### (ii) Socially Acceptable Traits

The socially acceptable traits, examined in the nine groups (p.171 ), were analysed to detect the possible observable traits for instructional use.

A high 'intelligence' factor was an obviously acceptable one; though this is not as easily observed as the others without more than just behavioural evidence. It was considered necessary to include this however.

The Observable Traits considered for final selection were chosen from the list of nine groups in the Examination of Literature: these traits were:

1. Questioning, Critical, Self-critical, Perceptive.
2. Adventurous, Not Afraid of Risks, Not Afraid of trying something 'new' Progressive.
3. Versatile, Likes Variety, Flexible, Fluent.
4. Persevering, Determined, Involved.
5. Contemplative, Introverted, Dreamer (Day-Dreamer)
6. Individualist, Unconventional, Independent, Non-Conformist.
7. Humorous, Keen Sense of the 'Funny side of Things'.
8. Emotional, Sensitive, Empathic.
9. Energetic, Industrious, the term 'dynamic' was also considered here but, as it had been selected in a different context - i.e. in the evaluation of the product (p.176 ) it was not admissible here.

Though all the traits listed here are unlikely to be observable at one time in a creative individual, it is probable that the majority of them would be observable at some point in time.

A further consideration that arose during this analysis, was that the 'interest' of the subjects involved in the study would probably be concerned with the 'identification' of such traits in their own personality. This was an added incentive to choose socially acceptable traits.

#### c) Selection of Observable Traits

The list of nine groups of traits was examined, and the one trait considered more representative, and desirable as an 'identification trait', was chosen from each group.

The final list of Observable, Socially Acceptable Traits found in the creative personality was:

Questioning, Adventurous, Versatile, Persevering, Contemplative,  
Individualistic, Humorous, Emotional, and Energetic, plus the Intelligence  
Factor.

It was felt that it might be advantageous to refer to the 'converse'  
element of these traits, in some cases, in the instructional programme.

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## CHAPTER ELEVEN

### SELECTION OF OBJECTIVES: STRATEGY

Following the choice of relevant factors, the next stages in the development of the programme were to determine the course objectives and to consider the appropriate approach strategy and programme structure.

This chapter describes these activities in two sections:

A. The Selection of Objectives, and B. Strategy and Structure.

#### SECTION A: Selection of Objectives

As has been observed in the Review of Literature (pp.96-98) the 'objectives' should be stated, as far as possible, in 'behavioural' terms. As Fry indicated (Review of Literature p. 97 ), the objectives must be stated in detail, they must say exactly what the student must learn or be able to do when the desired result is achieved.

Prior to the actual selection of the objectives it is useful to state the limits within which the objectives are to be realized, and the conditions under which they have to be attained. Mention has been made concerning some of the limits and conditions at various points in previous chapters. A brief resumé of these, and further limits and conditions are now listed under two headings: (a) Limits, and (b) Conditions.

A number of limits and conditions depend upon the 'target population' involved. These are dealt with here, and some other points concerning the 'target population' are also considered in Section B: Strategy and Structure (p.199 ).

##### (a) Limits

The programme is intended for male and female pupils of secondary school age: particularly those who are in the upper forms (3rd - 5th years: 14 - 16 years old)

It is aimed at pupils whose IQ averages 100, but should be suitable for those above and below the average.

It is intended to increase the creative ability of these pupils in

the visual creative area, and in the more general sense.

In such a 'subjective' field as 'creativity' it is very difficult to set a particular limit or target for this increase in the usual 'programmed instruction' tolerances of accuracy, speed and impact. It is to be hoped however, that 60% to 80% of the pupils who work through the programme will be able to:

- i) judge products as more or less creative
- ii) identify potentially creative persons
- iii) use a creative process to solve problems in general and visual fields.

The criterion by which the effectiveness of the programme is to be judged in this study, is by an increase in creative ability as measured by tests of creativity, personality, and scores on Art Works.

Final limits regarding the effectiveness of the programme in the future activities of the subjects are probably not measurable.

The work the subjects do whilst engaged with the programme should, however, provide 'feedback' that will be useful in judging the 'internal' effectiveness of the programme.

There are particular constraints that apply to the selection of 'Objectives' in the areas of the product, person, and process.

The criteria for selecting objectives concerned with products are that phenomena should be observable and lead to positive choice.

The criteria for identifying potentially creative persons require that factors for judgement should be socially acceptable, and observable.

The criteria for processes should be chosen from those that can be applied consciously, and used in a variety of situations for solving a variety of problems, including problems in the visual field.

The environmental limit, stated in general terms, is that the programme should be suitable for use as part of a normal course in a secondary school. Thus the objectives chosen should be such that they can be realised in 'units' that can be accommodated in normal school organization;

e.g. timetable. The limit concerning 'speed' is therefore dependent upon the way the programme is used in the course, timetable etc. concerned.

#### (b) Conditions

The conditions under which the programme is to be used should be considered in general and particular terms i.e. should be suitable for most school conditions and the special conditions pertaining to the school in which the programme is to be tested.

Some assumptions are necessary concerning educational characteristics of target population.

It is assumed that pupils will have no previous knowledge of 'creativity'; cannot judge products as more or less creative, cannot identify potentially creative persons; and cannot use a conscious creative process.

It is assumed that pupils can read; though it is also assumed that some learning problems will be met; e.g. poor readers, low IQ's, disturbed and apathetic pupils.

Particular assumptions concerning the pupils who will be subjects involved in the present study are:

They are 'rural' pupils, independent in nature, mainly concerned with the practical job of 'earning a living', and, in the main, those who have not passed the 11+, and are not in contact with 'city life' and 'culture'

It is assumed that pupils can use available media.

An important condition, is that the skills learned should be useful in general terms and visual terms, and that they should be used.

Environmental conditions taken into consideration are restricted to those pertaining to a school 'classroom' situation. No account can be taken of the environment external to the school, in selecting the objectives.

Conditions pertaining to the present study are:

- 1) the programme units must be restricted for use in the normal school timetable for 'art lessons'. Single periods (35 or 40 mins) and double periods (70 or 80 mins) are available.

- ii) the administration of the programme must not interfere with the running of the school.
- iii) the programme should form a part of the normal 'art course', in which 'theory' does play a considerable part, and not appear as something special. Some emphasis is already placed upon the production of work that is original, unusual, and their 'own idea'. The 'classroom' itself is roomy, light, well equipped, and subject to few outside distractions.

A wide range of media is available, but, for the purposes of the programme, will be restricted to 'two-dimensional' work performed using paint, pencil, crayon etc.

One final condition is that the programme, although intended for a particular 'target population', should be so constructed that it will be possible to use it in any English speaking secondary school.

The basic 'objectives' were therefore chosen with these criteria in mind. To a great extent the objectives chose themselves when the aims of the work described in the previous chapter were realised.

From the analyses described in Chapter Ten (Section C), it appeared that an increase in creative ability might be achieved if the subjects used a 'creative thinking process', such as brainstorming, to devise creative ideas, and then 'evaluating' the most creative of these ideas.

Some sense of 'identification' with traits often found in creative persons might also encourage their own creativity, or enable them to recognise and 'accept' the creative personality.

A crucial factor immediately became apparent. This was the fact that prior to judging ideas, products, etc. created by the use of any 'creative process', it was necessary that the subjects acquire 'criteria' for such judgement.

The first objective therefore, was that the subjects should be able to

judge products as creative, and to judge the degree of creativeness displayed. Without this ability, the implementation of any 'creative thinking process' would be more likely to lead to teeming confusion rather than fruitful production.

The other major objectives were that the subjects should be able to identify persons who are likely to be creative, should be able to outline the characteristics of 'creative processes' and should be able to use one or more such processes in their own creative work.

From the 'selection of the objectives' and the 'analyses' in Chapter Ten, the final statement of objectives was listed as follows:

(1) Objectives for Evaluation of Creative Products.

Subjects should be able to evaluate, judge, recognize, etc., the degree to which a product:

is Able to Do The Job; i.e. is Fit for the Purpose,

is Original,

is Dynamic,

is Complex,

is Integrated,

reveals Personality,

reveals Mastery of Subject,

reveals Mastery of Media,

Changes the Environment.

The ability to recognize the converse was implicit.

(2) Objectives for Recognition of Creative Persons.

Subjects should be able to recognize as 'possibly' creative persons those persons who were:

Questioning,

Adventurous,

Versatile,

Persevering,

Contemplative.



Individualistic,

Humorous,

Energetic,

Emotional.

Recognition of the converse was also implicit here.

### (3) Objectives for Creative Thinking Processes

a) Subjects should have knowledge of, and be able to describe the 'four stages' in the 'creative process'; i.e. Preparation, Incubation, (Thinking), Illumination (Solving), and Verification (Evaluation and Testing).

b) Subjects should be able to demonstrate their use of creative thinking processes. In particular, those processes involved in the 'Deferred Judgement technique (i.e. Brainstorming), such as 'no criticism', 'free-wheeling', combining, associating, and building.

Subjects should be able to use these processes in the 'visual field' as well as in more general creative thinking.

### SECTION B: Strategy and Structure.

Three areas were involved in the preparation discussed in this section. Once the objectives had been stated, methods of attaining the objectives were considered. The three areas involved were; instructional strategy, programme structure, and subjects and motivation.

#### 1. Strategy

From the Examination of Relevant Literature (pp.177-78) a number of methods of increasing creativity, and the various strategies there employed, were considered. As was noted (p. 178) there were few programmes concerned with increasing creativity in general, or in the visual field.

Many learning strategies were suggested or used by various investigators, but a number of these were not relevant to 'programmed instruction' e.g. changing environmental conditions.

There appeared to be two basic strategies involved in attempts to

increase creativity. Kneller (1965) stated (Review of Literature p. 65 ) "One way is to teach it as a new subject or skill. The other way is to modify the present curriculum. Either we teach creativity in its own right or we draw upon the creative potential in all the subject matter we treat."

The present study was concerned to increase creativity, initially, in one subject area, i.e. the visual area. The modification of the whole curriculum was not possible, and as the objectives indicated, a knowledge of 'creativity' itself was desirable.

The strategy of the 'direct approach' was therefore selected: 'creativity' would be learned as a subject or skill in it's own right; though the final instructional devices would have to involve the subject in creative activity in the visual field. To a certain extent, therefore, the creative potential in the subject matter would also be involved.

Though Kneller, and others, were of the opinion that the direct approach was not the best, and a number of those programmes that had been devised used an indirect approach, it was considered that Programmed Instruction would make the 'direct' strategy effective and easier.

## 2. Structure.

From the analysis and selection of objectives, three areas appeared that indicated a structure for a programme to achieve the objectives. These three areas were; the creative person, the creative process, and the creative product.

It was at this point that the structure of these areas into a 'appropriate sequence' was considered. The order, Person, Process, Product is the one that normally springs to mind when 'creativity' is studied. Most research and writing on creativity adopts this order, as was noted in the Review of Literature where it was also used.

From the instructional point of view, however, this order did not appear to be the most sensible. The selection of objectives indicated that

the first priority was that the subjects should be able to evaluate a product as creative or not. The first section of the structure of the programme, would, therefore have to be concerned with the product and its evaluation.

The structural positions of the two remaining areas were next considered in terms of the most suitable order for the learner. As the final section of the programme was intended to involve the subjects in practical creative production, where he would be using creative thinking processes, it was felt that the material concerned with the 'process' of creation should lead immediately to this work, and thus be fresh in their minds. The 'Process' area was thus selected as the last section in the main structure of the programme.

The instructional area concerned with the creative 'Person' was concerned with simple 'identification'; more in the nature of 'fun', as far as the subject would be concerned. It was felt that the best place for this would be in between the two 'heavy' sections.

The final structure decided upon for the sequence of the three areas was thus:

- a) The Evaluation of a Creative Product.
- b) The Identification of a Creative Person.
- c) The Recognition and Use of Creative Thinking Processes.

Though this is not the most usual order for considering these 'creativity areas', it was felt to be the most suitable structure for the purposes of programmed instruction.

### 3. Subjects and Motivation.

A) The subjects and their environment were described in Chapter Ten (pp.180-2). In addition to the factors discussed there, some further factors were considered in the programme preparation.

As mentioned previously, the IQ range was wide, and the programme would have to allow for this. However, it was decided not to set the level

of the programme too low, but to aim at the average, i.e. to consider an IQ of 100 as the population average for the programme. Some of the subjects were unable to read well when they were in their first year at the present secondary school. They would be third year pupils when the programme would be administered (i.e. aged 13 - 14 years). However, these pupils had been receiving remedial reading instruction since the first year. It was decided, therefore, to disregard the reading age factor, although the level of language used would, as far as possible, be within the subject's experience.

No differentiation was considered as far as sex differences were concerned.

The subject's out-of-school environment was kept in mind, but was not a major factor as far as the construction of the programme was concerned. The classroom environment was considered relevant to the programme development, as the programme would have to be administered in the normal classroom and during normal timetable periods.

#### (b) Motivation.

Motivation was considered from two points of view. First the question of motivation for creativity, and second, the question of motivating the subjects within the programme itself.

The general area of motivation was not included in the Review of Literature, as it is a complex and controversial area of research in its own right. It was only considered in the review where it was directly relevant.

Stein (1967) stated in answer to the question "Why does the individual create?", that "... one might say, ... that there is a lack of closure, or, ... that the individual experiences a lack of satisfaction with the existing state of affairs."

Whilst this may be a basic truth as regards motivation for creative activity, it is of little practical use in attempts to increase creative

activity, it does not indicate any way in which an individual may be instilled with 'lack of satisfaction' as a directly controllable motivating factor. The control of motivation, of this basic nature is outside the scope of our present knowledge, and was not acceptable as a factor in this study.

It was, of course, accepted that many psychological factors are involved in motivation for creative activity. As Hudson (1966) states "... the factors that determine an individual's creativeness are personal and not intellectual" Such a view may be an overstatement, but it is unlikely that a programme of instruction would turn a non-creative personality into a creative one. The most that could be hoped was for the development of any creativity that was already present.

The second 'motivation area' considered was that relevant to programmed instruction itself. In addition other factors that might be motivating from the 'interest' point of view, were also considered.

The questions of 'Active Overt Response' and 'Immediate Knowledge of Results' were discussed in the Review of Literature (pp.93-94 ). It was accepted that 'feedback' would probably be a motivating factor to the majority of subjects when working through a programme adopting these concepts. It was felt, however, that this type of motivation would be of a more tenuous nature as far as some of the subjects involved in the present study were concerned (i.e. those of low IQ, disturbed or apathetic) and that the factors of structure content, and presentation of the material would be of equal importance.

Moore & Smith (1964) reported "... it is possible to conclude that effectiveness of self-instruction materials ... may be attributable to the format of the material rather than to the use of a technique for providing immediate knowledge of results ."

One further consideration also arose at this point; that was the fact that 'creative activity' is often concerned with 'open ended' activity, and thus knowledge of results in terms of 'correct response', which is the essence of 'Positive Reinforcement', is not always possible in material dealing with

creativity.

In general however, it was accepted that the variety of factors that make a 'Programme' do, on the whole, have a motivating influence.

Smith & Smith (1966) point out that "For the human learner at School, utility and satisfaction emerge, not from extraneous rewards but from the intrinsic coherence of logical knowledge and skilled activities - from the correctness of solutions, from the validity of concepts, or from the esthetic balance of artistic efforts." Whilst the concept of 'correctness of solutions' may not be entirely applicable in the present case, as mentioned above, the motivating influence of recognising the 'validity of concepts' may well be significant in the present study.

Smith & Smith (1966) state further "Theories of learning based on psychological drives and extrinsic rewards never have been able to account for motivated acts of creation, of discovery, of seeking, of volition in individual behaviour. ... Often he is more interested in doing things in his own way - that is, as he can control them - than he is in attaining social approval or extrinsic reward offered for some other mode of response."

Other factors were also considered in the area of motivation, particularly the concept of 'arousal'.

Vernon (1969) stated "Arousal continues to be caused by novel and intense stimuli, ... and also unexpectedness." She also shows three ways in which the 'need for variety' expresses itself: "(1) the desire for environmental conditions that in themselves offer novelty and variety, which are then experienced relatively passively; (2) curiosity appearing in active exploration of the environment; and (3) active use of the cognitive processes and especially the imagination, to provide unusual, original and stimulating ideas."

As far as the actual material content & the internal structure of the programme were concerned, these concepts of novelty and variety, and the interest of the subject in doing things in his own way to control them were kept in mind throughout the construction of the programme.

## CHAPTER TWELVE

### PROGRAMME CONSTRUCTION

The next stage in the development of the programme was to construct the programme to achieve the objectives.

This was undertaken in two stages; the design of the programme 'format', and the actual construction. In this chapter this development is discussed in two sections.

#### SECTION A: PROGRAMME FORMAT

As was noted in Chapter Eleven, it was decided to try and achieve the objectives using direct methods.

The main objectives, briefly, were that the learner should:

- (a) be able to evaluate the degree of 'creativity' a product reveals
- (b) be able to identify the type of person who may be creative,
- (c) be able to describe some creative thinking processes,
- (d) be able to use one of these processes, i.e. 'brainstorming', for the creative solving of (i) general problems, and (ii) problems in the visual field.

It was obvious that these objectives could not be attained in one programmed unit within the environmental classroom conditions outlined in Chapter Ten, and for the type of subjects involved.

The major criteria, therefore, that directed the format of the programme were:

Each section of the programme would be in a 'unit' that could be worked through by the average subject in either a single or double period in the normal classroom timetable.

It was decided to divide the programme into 'Three Elements', some requiring further division into the 'Units'.

The final format chosen was:

ELEMENT ONE: The direct learning of 'Creativity'. In three 'units':

Unit 1 Evaluation of the creative product.

Unit 2 Identification of the creative personality.

Unit 3 Knowledge of some creative thinking processes.

ELEMENT TWO: Learning and using the 'brainstorming' process. . In two 'units':

Unit 1 The 'brainstorming' process.

Unit 2 Using the 'brainstorming' processes in general terms.

ELEMENT THREE: Using the 'brainstorming' process in the 'visual' field.

One 'Unit':

'Brainstorming' a painting. The painting itself would be performed after the programme had been completed.

#### SECTION B: PROGRAMME CONSTRUCTION

(NOTE: The final CREATIVITY PROGRAMME can be seen in the Appendix Part Seven . The reader is invited to refer to this whilst reading this section)

Considerations concerning programming and creativity, as examined in Chapter Ten, and Objectives, Subjects, and Motivation, as examined in Chapter Eleven, were kept in mind throughout the construction of the programme.

Methods used in programming in the strict 'classical' sense were not all applicable to programming for creativity, especially as in a number of units the responses were required to be many, varied, and often neither right nor wrong. Recent developments in programming (as noted in Chapter Ten), however, have opened the way for more flexible programming methods.

Normal concepts of 'optimum step size', 'active overt response', 'self-pacing' etc. were adopted or adapted, where necessary and possible, in conjunction with more recent concepts.

The 'objectives', as stated in Chapter Eleven (p. 196), had laid the framework for the programme construction, particularly as far as Element One was concerned.

The decision was taken at an early stage to construct the programme so that it could be used by one person, in pairs, or in small groups using



discussion techniques; particularly bearing in mind that the reading age of some of the subjects involved in the present study would be low, and that working in pairs or groups would thus be a help to them.

Some of the construction was developmental, i.e. it was developed in the field by 'trial and error' methods with learners of the same age, but who were not involved in the study. Thus to a certain extent those sections so developed were 'learner based' in that the experimental learners were the final arbiters.

The actual construction of the programme covered approximately six months of part-time work, including development and trials. The programme units were cyclostyled a few weeks prior to the administration of the programme unit concerned. A two-page 'Reminder Leaflet' was developed to be given to the subjects for their own use when they had finished Element Two. These 'revision frames' were felt necessary when it became apparent that a considerable time would elapse between the administration of the Element One/Unit one and the start of the actual 'brainstorm' for visual production.

It was further decided to give each subject an 'Appendix' as a stimulation to their own creative approach to 'life in general'.

The construction of the separate Elements and Units that comprise the total programme, is now discussed under the headings that were used for the Elements and Units of the programme.

#### ELEMENT ONE: "WHAT IS CREATIVITY?"

This Element was considered the 'kernel' of the whole programme. The objectives, set out in the three sections in Chapter Eleven (p.196 ), were, with the exception of the practical methods of 'brainstorming', to be attained in the three Units of this Element.

The crucial objectives in the Element were those concerned with the evaluation of the creative product, and were placed first in the structure of the Element.

Unit One was concerned with the Creative Product; Unit Two with the Creative Person, and Unit Three with Creative Processes.

#### UNIT ONE: "What is a Creative Product?"

The first task was to establish the order of the objectives in the Unit. After a few variations in the listings, however, the original order in which the objectives were listed was accepted.

The next task was to consider what factors might be motivating, in addition to the type of motivation inherent in programmed instruction. The decision was made to motivate using factors such as novelty, mastering skills, discovery, etc. as discussed in Chapter Eleven (p.200), by using a 'game' type format.

The subjects would evaluate and score products for 'creativity' and be able to compare their scores with a 'master score' when they had finished the unit.

A set number of products would be worked through using a 'programmed guide' for evaluation.

The first step in the construction was the development of a 'Flow Chart' illustrating the stages in this process.

Table 12:1 (next page) shows this chart in full.

The chart reveals that a decision has to be made at each of these stages; i.e. each stage is concerned with one of nine evaluation factors. The judging of each product would entail working through the various branches of the whole decision tree.

When a number of products had been evaluated, it was hoped that the subjects would be able to score the products without reference to the instructions for decision making, and would have learned the names and

PROGRAMME FOR CREATIVITY. ELEMENT ONE: WHAT IS CREATIVITY?

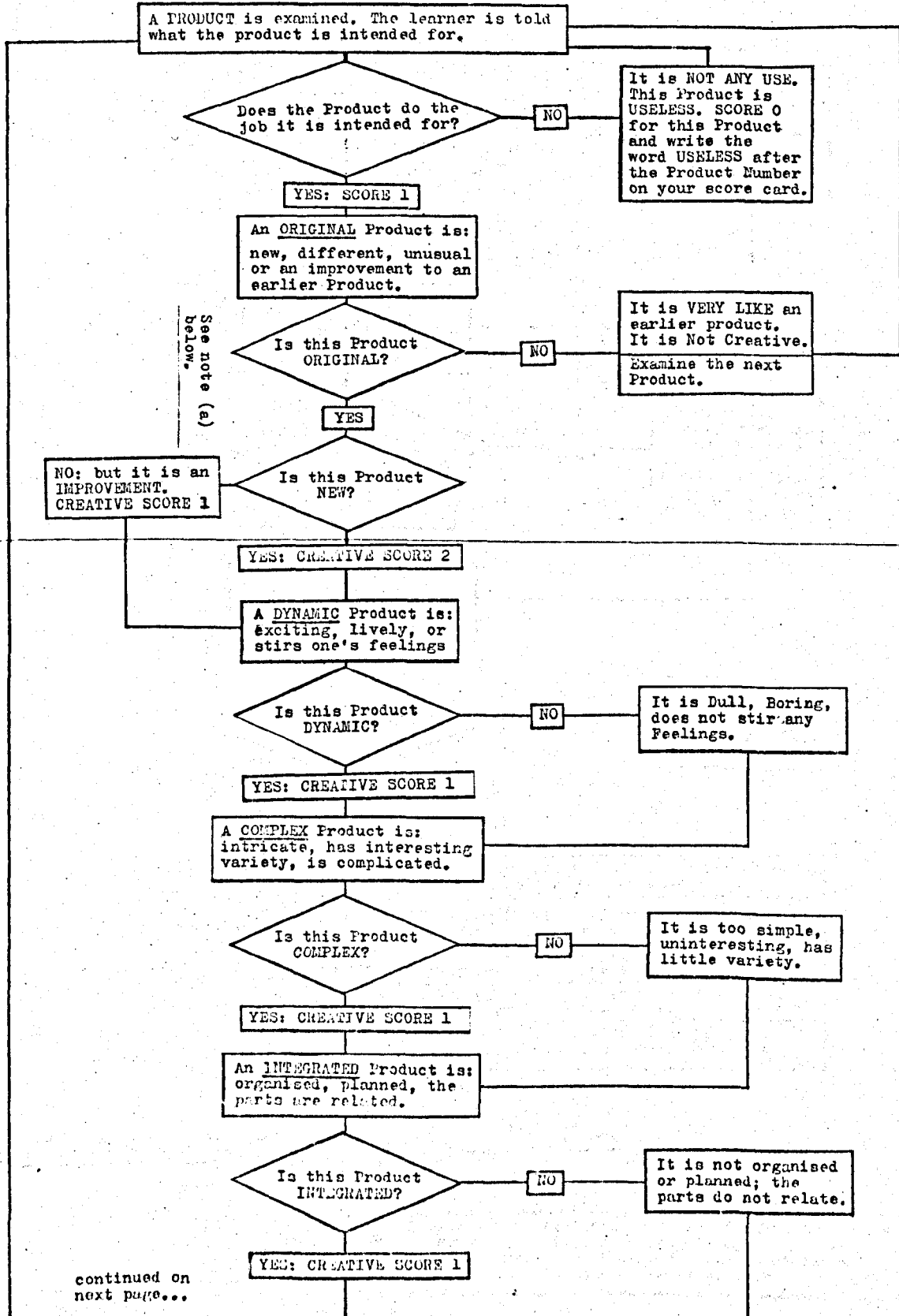
TABLE 12:1 (page 1)

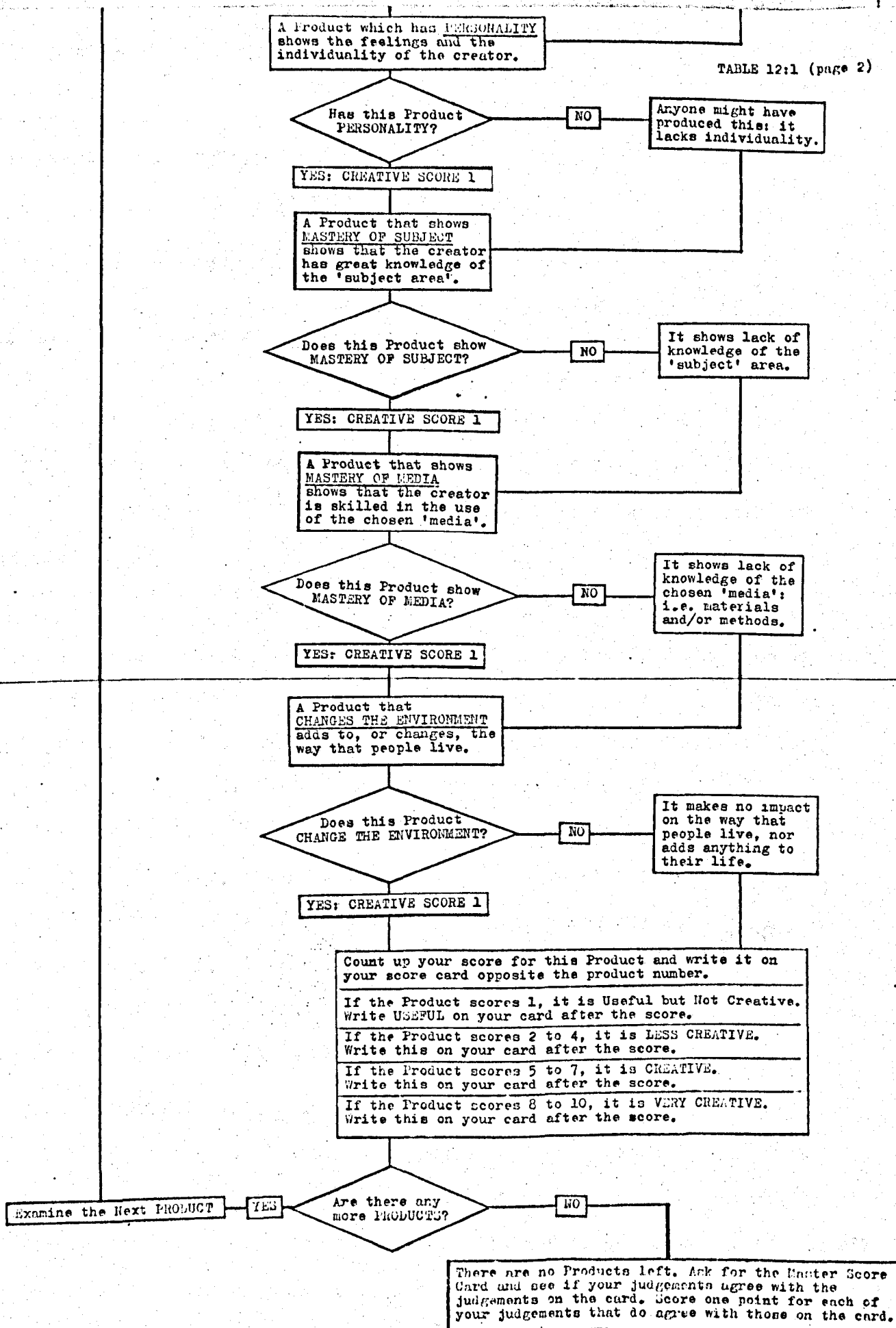
UNIT ONE - WHAT IS A CREATIVE PRODUCT?

FLOW CHART FOR MAIN SECTION OF PROGRAMME UNIT

It is intended that this section should be a 'game' of a type. The learner will score points for 'creativity' as he works through the section.

NOTE (a): The SUB-PROGRAMME to be inserted at this point will be part of the information given to the learner on the sheet concerned with the particular product he is examining. This information will consist of that information that he is unlikely to know already.





meanings of the factors involved in evaluating products.

The choice of terminology was carefully considered. Some degree of simplification was made, but, as the substitution of simpler terminology was not often possible, the factor names were retained.

A degree of expansion on the 'meaning' of each factor was inevitable.

It was decided that a score for a product would range from 0 - 10, according to the degree of relevant creativity the product was judged to display.

Five verbal degrees of creativity would also be elicited according to the score a product obtained. These verbal judgements were: Useless, Useful but not Creative, Less Creative, Creative, and Very Creative.

The fact that some evaluative decisions can be a 'matter of opinion' would also have to be made clear to the learner.

A number of ways of presenting the 'decision tree', the products to be evaluated, and working definitions of the factors involved, were considered.

One consideration was that the 'flow chart' alone plus a selection of actual products would possibly achieve the desired result. The cost of obtaining a number of different products, that covered a wide range of 'creativity scores', in sufficient numbers for a class administration, however, was prohibitive. Also, the chart alone did not give definitions in sufficient detail for the type of learner involved. To expand the chart definition and give examples would result in an unwieldy presentation. Reluctantly this approach was abandoned; though the possibility of using this method with more advanced students was kept in mind.

The problem fell into four sub-problems:

- (a) How should the 'decision tree' be presented?
- (b) What Products should be chosen, and how should they be presented?.
- (c) How should definitions and examples of the decision factors be presented?
- (d) How should the scoring be performed by the subject?

After much research and 'trial and error' the unit emerged with four separate sections and a set of instructions for using them. The four sections were contained in an envelope with the instructions for using them printed on the outside. The Unit consisted of:

- 1) a programmed booklet constructed on a linear basis, with 'loops'
- 11) a booklet of examples of the factors.
- 111) a set of 'Product Cards' with any extra information the subject may need
- 1V) a score sheet.

The instructions on the envelope told the student what was in it, and how to lay out the booklets and cards etc. for use.

The Programmed Book contained the introduction and instructions for working through the programme using the Product Cards, The Example Booklet, and Score Sheet.

The Example Booklet only showed examples of those factors where it was felt advantageous to give examples; i.e. the factors of Originality, Dynamism, Complexity, Integration, Personality, and the ability to Change the Environment.

The products chosen were the ten products remaining after a selection process performed on a great number. The task was found difficult, as a variety of different types of product were desired, and they had to elicit scores in the chosen range, from 0 to 10. The products that were chosen did appear, in the trials made, to be fairly reliable from these points of view.

In brief the products chosen were:

1. A Battery Operated Radio
2. A Modern Hexagonal House
3. A watch made in 1968 (a copy of an old watch)
4. A 6 Gallon plastic Water Carrier or Transporter
5. A Painting by J.Miro
6. A Foam Sponge
7. A Baby Carriage of 1850
8. An 'Elephant Fence' made of thin bamboo and string (Useless)
9. A wax Candle
10. A Raft, made by children.

## UNIT TWO: "Who is likely to be a Creative Person?"

It was originally intended to use a similar format for this unit to that of Unit One. On reflection, however, it was decided that this may place too much emphasis on the recognition of the creative person. This was not desired. As was stated previously, the main objective of this unit was the simple 'identification', or converse, of the subject himself with the traits of the creative personality (i.e. the nine chosen traits: Questioning, Adventurous, Versatile, Persevering, Contemplative, Individualistic, Humorous, Energetic, and Emotional).

The final format chosen was that of providing information concerning nine chosen traits, and six stories giving verbal outlines of six different personalities. The subject would have to decide whether or not these personalities were likely to be creative.

The subjects could refer back to the information when making these decisions. The decisions, and the reasons for making them, would be written on a special answer sheet, which could be compared with a 'master' answer sheet.

The 'information frames' were largely in the form of illustrations.

The order of presentation of the factors, as listed in the 'objectives for the recognition of the creative person' (pp.196-7) was changed slightly for the programme unit. It was felt that the 'energetic' factor should be placed before the 'persevering' and 'contemplative' factors, rather than be placed near the end.

Though it is possible that the order of the factors is not critical, it was felt the impact of the factors first and last mentioned may be greater than those in the middle of the unit. To overcome any unevenness of impact in the reading of the unit, whether the first met or the last met are more likely to be remembered, the list of factors, and a summary defining these traits, was given at the end of the Unit; mainly for reference whilst the subject was making his decisions.

The introduction was intended to lead the subjects to compare their

own personalities with the nine traits shown; and also to reassure those who were not able to 'identify' themselves with a creative personality. There was, however, an implied hint that it was desirable to be creative. The important 'intelligence' factor was also mentioned, but not stressed, in the introduction.

### UNIT THREE: "What methods do Creative Persons use to produce Creative Products?"

As it had been decided to make Element Two the 'active' one concerned with the 'deferred judgement' process, Unit Three of Element One was basically intended to introduce the learner to the idea of four stages in the creative process.

It was resolved, therefore, that this unit should be 'passive', and of an 'informative' nature only. It would be pointed out that our knowledge of these creative processes is limited, but that the 'four stages' (i.e. Preparation, Incubation, Illumination, and Verification) appear to describe the 'stages' involving the processes reasonably well.

A 'quiz' type of question paper was prepared, to be administered at the end of the Unit; but finally, it was decided not to use this. It was not an essential part of the programme that these 'four stages' should be learned; though ability to outline their characteristics was one of the objectives selected (Chapter Eleven p.197 ). It was felt, at this point in the programme construction, that ability to use the 'deferred judgement process' (i.e. brainstorming) would be more likely to lead to an increase in creative ability. Emphasis on the four stages, where our knowledge is more hazy, might lead to confusion in the mind of the learner.

This Unit was, therefore, simply a presentation for 'covert' response, and was kept short.

It was presented using drawn illustrations as much as possible, and giving examples of a few of the processes, used in the incubative stage, which also may be used in the 'brainstorming' method.



## ELEMENT TWO: "BRAINSTORMING"

Element Two was conceived in two linked units that were intended to be used together. Unit One would be a straightforward presentation, in simplified form, of the 'brainstorming' methods devised and adapted by Osborne, Clark, Gordon, Parnes etc. . . Unit Two would consist of material involving the subjects in actual 'brainstorming'; in the first section of which the subjects would refer to Unit One.

A 'trial' Element was prepared on these lines and tested. This trial proved successful, and little was changed in the final format for Unit One. The selection of the 'problems' for brainstorming in Unit Two proved more difficult, but those finally chosen, after a few trials, appeared to be reasonably stimulating to the learners involved.

### UNIT ONE "How to Brainstorm"

The objectives for the 'brainstorming' process were based on those common to most brainstorming methods, as mentioned in Chapter Eleven (p.197 ) and, in particular, those suggested by Clark (1958) in the Review of Literature (pp.77-78). Basically the Unit was constructed so that the learners would appreciate the preliminaries necessary prior to actual brainstorming, the conditions essential during the session, and a method of evaluating the ideas after the session.

The introduction also made the learners aware that the brainstorming method could be used in groups as well as on one's own.

The Unit itself was concerned with: the choice of problem, preparing the mind: four rules for brainstorming (no criticism, free-wheeling, quantity of ideas, and combining), time limits, and the importance of 'recording' all ideas.

In the section on evaluating the ideas it was mentioned that it was important to 'use' the ideas obtained for solving the problem.

As the booklet was intended to be used as a simple 'reference' unit, whilst the subject was engaged in 'overtly' responding to Unit Two, it was kept as short and intelligible as possible.

## UNIT TWO: "You try some Brainstorming"

The Unit first developed for the trials had one section with three problems for the learner to work on. Each of these was given a time limit of 10 minutes (timed approximately by the learner), and reference could be made to Unit One at any time.

It was immediately apparent in the early trials that this led to a reduced time for actual brainstorming, and that the interruptions while referring to Unit One were not conducive to a 'real' brainstorming situation.

A second version of the Unit was then prepared in Two Parts. In the first part three problems were set that were to be brainstormed in 5 minutes each, using Unit One as a reference. In the second Part three further problems were set that were also brainstormed in 5 minutes each; in this case no reference was allowed to Unit One.

This second version enabled the brainstorming to be nearer to a 'real' situation, though no preparation was possible. This format was found to be satisfactory in the trials.

The choice of problems, for both Parts of the Unit, was not easy. The problems should be soluble, and with as great a variety and number as possible. They should also be within the scope of the subjects experience, so that no preparation in the technical sense would be required.

Where possible they should be problems whose solutions would be useful to the subjects themselves in their daily life; either in their practical application in day to day living or in developing their awareness of creative work in the visual field.

In the final selection it was decided to pose two problems that required verbal solutions and one that required a graphic solution, in each part.

The problems to be 'brainstormed' were:

### Part 1

1. How many different ideas can you think of to make it 'Safer to Live' at home?
2. How many different drawings can you do, starting each drawing with a triangle?
3. How many ways can you think of to make your clothing last longer?

## Part 2

1. How many ways can you think of to earn extra pocket money?
2. How many different designs can you think of for a bottle for a new 'soft drink'?
3. How many ways can you think of for using up waste packets, tubes, boxes, etc. made from cardboard or plastic?

A 'Brainstorm Sheet' was provided for the subject to work on, and on completion of Section One, a 'Master Brainstorm Sheet' for each problem would be given to each subject for comparison with his solutions. The Master Brainstorm Sheet also included a few comments on selection of the 'best ideas' and the difficulties involved. No insistence on the best idea was made in these comments, as it was desired that the selection process would also be an 'open ended' problem for personal choice.

For the problems set in Part Two no Master Brainstorm Sheet was given. The subjects would make their own decision regarding their list of brainstormed ideas, and be allowed to make a personal note of their final choice.

When the trials of the final form of this Unit were made, the problems appeared to be interesting to the pupils involved, and a more 'real' brainstorm session occurred in Part Two.

### The "Reminder Leaflet"

At this point in the construction of the programme it was felt, now that the objectives had mainly been covered, that some revision material would be advisable.

A 'Reminder Leaflet' was prepared that summarised the factors covered in the first two Elements.

The first page of the leaflet revised the material presented in Element One, and the second page summarised the 'brainstorming' methods dealt with in Element Two.

It was intended that this 'Reminder Leaflet' should be given to the subjects for their own use. They would be able to keep it, and refer to it if they wished when doing the rest of the programme and any other work.

### ELEMENT THREE: "BRAINSTORMING A PAINTING"

The idea of using the 'brainstorming' technique to produce a 'work of art', that is a particularly personal creative act, was perhaps the most uncertain area of the programme.

Various presentations and formats were considered and some tried out. The final format for this Element, which was one Unit only, consisted of four parts.

The introduction included a reminder of the criterion factors for evaluating a creative product.

The problem was to produce a painting that expressed an emotion. A choice of three basic emotions was offered: Misery, Joy or Fear.

Once the choice of emotion had been made, four stages were structured to lead the subject to the final painting.

Stage 1 entailed a 20 minute brainstorm session for the individual learner.

A list of words and ideas would thus be obtained that would express the emotion.

Stage 2 was a 20 minute experimental session with various media; the

subjects were expected to 'act' rather than 'think' in this stage.

Stage 3 was intended to combine the best ideas found in stage 1 with shapes, colours, etc. selected from stage 2 that the subjects considered visually expressed the chosen emotion. 20 minutes was allowed for this section also.

Stages 1, 2, and 3 would be performed in a normal 'double period' in the school timetable.

Stage 4, which would be performed at the next 'double period', was the final stage in the programme activity. The actual painting would be performed in about 60 minutes. The subjects would use the ideas and colours that they had selected from the first three stages. The work would be done on the paper provided ( $\frac{1}{4}$  Imperial Cartridge Paper).

A final comment in Element Three encouraged the subjects to use creative techniques whenever trying to solve problems at home, school or work.

APPENDIX: HINTS FOR IMPROVING YOUR CREATIVE POWER.

As a completion to the programmed course an 'Appendix' sheet was devised. In the Appendix hints were given for improving creative power. These were based on some of the ideas and findings discussed in the section on 'Methods of Increasing Creativity' in the Review of Literature (pp.63-69).

This Appendix would be given to each subject to keep for his own personal use, in an attempt to 'open the mind' and develop a creative attitude to life. The Appendix, together with the Reminder Leaflet, would serve as a reference and revision for the whole concept of creativity presented in the programme.

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## CHAPTER THIRTEEN

### OTHER CONSIDERATIONS

This short chapter deals with some of the other problems and considerations that arose during the construction of the programme.

The presentation and choice of the products to be evaluated was one area where problems arose, as was mentioned previously.

It was desired to present the products (i.e. illustrations of products) on their own, without any information concerning them. Unfortunately, the subjects', and indeed our own, 'historical' knowledge of all types of products is limited. It was apparent that some information concerning similar products from the 'past' was essential for the valid judgement of 'originality'; either 'new' or 'an improvement'.

It was first thought suitable to provide this information on a separate card. This proved to increase the items in Element One: Unit One to a number that became unwieldy.

This information was therefore given on the Product Cards with the illustration, plus a few other pieces of relevant information, forming a 'sub-programme' (see Note (a) in the Flow Chart Table 12:1).

It was hoped that a satisfactory balance had been obtained between the amount of information given and the degree of evaluative judgement required by the learner.

In view of the number of copies of the programme required, it was decided to run these off on an ink-duplicator. This entailed the preparation of stencils.

The choice of reprographic process to obtain the stencils for duplication was a problem in the case of the 'Product Cards'. The 'Xerox' type of process could handle the type or the photographs but not both on the same sheet. Those stencils that included type and photographs were eventually cut on an 'electronic stencil cutter' which was found satisfactory.

In the case of product No.5. (the painting by J.Miro) the 'colour factor' was considered important. As it was not practical to reproduce it in colour at this experimental stage, it was resolved to display a colour reproduction where the learner could see it. A note to this effect was made on the relevant product card.

Actual examples were also presented in the case of some of the other products; (a) to add variety in product No.6 (foam sponge) and No.9 (wax candle), and (b) was considered necessary for product No.8 (elephant fence) to confirm the stupidity of the idea.

In the actual presentation the intention was that the entire programme should be printed on 'quarto' size paper. (the programme was complete before the general introduction of A4 size).

For the convenience of the learners however, the examples of solutions to the problems given on the 'Master Brainstorm Sheets' were presented on 'foolscap size'. The solutions to the three problems were thus able to be presented on three separate sheets for ease of comparison.

To facilitate the layout, the 'Reminder Leaflet' was also presented on two sheets of 'foolscap', in its two distinct sections.

The majority of the illustrations in the programme were line drawings. The original graphic ideas were prepared by the author and the final ink versions were executed by J.Williams.

On completion of the Unit One (Element One) some doubt was felt concerning the final selection of the products and the scoring. A number of other products were examined, and a few products were re-scored. In view of the 'subjective' nature of the evaluative procedure, and the fact that other products examined were found to be no more satisfactory than those already printed, it was decided to leave the unit in the present form for the experiment. The feedback from the experiment would probably indicate areas where improvement could be made in this area and in others, e.g. verbal content, presentation, or sequence.

It was found difficult to judge the level of language apprehension that would be suitable for the average learner in this situation. Many of the concepts, and some of the terminology used to express them, would be new to the learner. The explanation of the terminology was kept as simple as possible, but some concern was felt that the language level may be too high. Against this fear, of course, was the decision not to 'write down' to the learner.

The trials did not indicate that the language was too difficult, but those pupils who were involved in the trials were, perhaps, slightly above the average. It was decided not to compromise, and no reduction was made in the level of language used.

A final consideration was concerned with the difficulty of ascertaining whether the subjects had really learned to use the 'brainstorm' technique in Element Two. Various methods of doing this were contemplated. Putting Unit One of the Element into linear form, with responses and post-test, was considered. It was decided, however, that the feedback obtained from the actual 'brainstorm' sessions in Element Two, both Section One and Section Two, would provide sufficient information in this area.

The considerations discussed in this chapter would, of course, be taken into account in any future development of the programme.

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## PART FOUR STUDY TO TEST HYPOTHESIS B

### CHAPTER FOURTEEN

#### INTRODUCTION-DESIGN OF THE STUDY: SUBJECTS AND PRE-TESTS

##### Introduction - Design of the Study

As a result of the study to test hypothesis A, instruments were found that were capable, to a large extent, of measuring creative ability in the visual field, and, as described in Part Three, a 'creativity programme' was developed in an attempt to increase creative ability both in the visual field, and in more general terms.

It was now necessary to design a study to test Hypothesis B. Hypothesis B in its 'null' form, as developed in Chapter Four, implied that, following the administration of a creativity programme, there would be no significant difference between the means of the pre and post-test scores of male and female, control and experimental groups, on the creativity measures.

It was decided to test the effectiveness of the programme by using a design incorporating both control and experimental groups. The design involved the use of pre-tests for both control and experimental groups, instruction for the experimental group and post-tests for both the control and experimental groups.

It is admitted that this design is not perfect - no design can be - but in the environmental conditions prevailing it is a practical design for 'field' research.

It would have been preferable to have been able to control all other relevant variables in addition to the independent variable, and to have used random sampling methods as far as the selection of the subjects was concerned. However, as is often the case in 'field' experiments in education or psychology, this was not possible in the present study.

The study to test Hypothesis B incorporated a subsidiary section, as indicated in Chapter Nine (Note on p. 167 ). This was the examination of the pattern of correlations between the TTCT scores and Art Work scores

obtained from those subjects involved in studies to test Hypothesis A and Hypothesis B; i.e. those subjects who were 1st year pupils in 1967/68, and were 3rd year pupils in 1970.

As a result of the relationships found between the 'creativity tests' and the 'Art Works', it was decided to use the TTCT and the Art Works as the test instruments for pre-tests and post-tests in detecting any change in creative ability. The CPQ/HSPQ was also included in the post-test battery, as it had been used with the pre-tests.

It was the intention to evaluate the 'programme' on an 'internal' basis. This was for the purpose of 'feedback' for future development rather than a test of the effectiveness of the programme. It was not considered that the subject's actual performance in the 'overt' response sections of the programme would be indicative of his creative ability level. For this reason, the tests chosen as pre-tests and post-tests were used as indicators of any change in creative ability.

Page Two of the Timetable (Appendix; p. 3 ) shows details of the design of the Study to test Hypothesis B.

### Subjects

The subjects involved were those pupils comprising the 1st Year Forms 1 & 2 in the study to test Hypothesis A in 1967/68. These pupils were 3rd Years in 1970 when the study to test Hypothesis B took place.

The subjects were in two unstreamed forms in a rural secondary school. The statements made regarding the subjects involved in the study to test Hypothesis A (Chapters Five and Eleven), regarding background, interests, etc., are also applicable, of course, to the subjects involved in the study to test Hypothesis B.

Due to 'drop outs' between 1968 and 1970 the number of pupils in the 3rd year Forms 1 & 2 were slightly fewer than when they were 1st year pupils.

The numbers remaining in the two forms were:

Form 1	:	Males 11	Females 8	Total 19
Form 2	:	Males 10	Females 12	Total 22
Total		Males 21	Females 20	All S's 41

Form 2 was chosen as the experimental group for two reasons:

- a) it was the slightly larger group,
- b) the group's scores on the creativity measures were slightly lower than those of Form 1 ( in 1967/68).

It was not possible to re-adjust the composition of the two forms for experimental purposes, nor was it desirable if 'normal' conditions were to be maintained. The groups were, therefore, not matched and were not randomly selected.

No 'IQ' test was used. As was mentioned in Chapter Five (P. 113) the intelligence factor was not involved in these studies. The scores on Factor B (Intelligence) of the CPQ, however, were examined to see if there was any indication of a large difference in 'intelligence' between Form 1 and Form 2.

The scores of the two forms were not greatly different. The means for Factor B scores were: Form 1: 49.47; Form 2: 51.36, and the scores ranged from 0 to 100.

The Experimental Form (Form 2) thus were slightly higher, on this measure of 'intelligence' than the Control Group (Form 1) This difference was not statistically significant.

A few of the subjects were 'poor readers'. Although all could read to a certain extent, some were rather slow; this was taken into account when the practical administration of the programme and tests took place.

#### Pre-tests and Administration.

The pre-test battery was comprised of:

- a) CPQ (Form A) Scored on Creativity and Exvia Factors
- b) TTCT (Figural Form A) scored on Fluency, Flexibility, Originality, and Elaboration.
- c) Art Works 1 & 2, scored on Gestalt, Spontaneous, Originality, and Involvement.

These tests were administered to the 1st year subjects as part of the study to test Hypothesis A: as a result of the findings in this study, it was decided to utilise the scores of this administration as the pre-test

scores for the study to test Hypothesis B.

The decision was also taken, of course, to use the same tests, in equivalent forms (i.e. HSPQ, TTCT - Figural Form B), as the post-tests following the administration of the programme.

Although the personality test (CPQ/HSIQ) was not found to be particularly reliable, it was decided to include it in the post-test battery to check the relationship of the Exvia factor to other factors.

The details concerning the selection of the Tests, the development of the Art Work judgements and their administration, were given in Chapters Five, Six, and Seven.

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## CHAPTER FIFTEEN

### ADMINISTRATION OF THE PROGRAMME

#### General Factors in administration

When the 'Creativity Programme' was completed it was administered to the experimental group between October 1969 and January 1970 - a total of approximately eight hours actual working time. The timetable of the administration is given in the Appendix (p. 3 ). The programme was performed during the normal art periods in the school timetable. It was necessary to present the programme as part of the 'normal' school work to avoid, as much as possible, any 'Hawthorne' effect.

Due to bad weather, timetable alterations, etc. it was not possible to work through the complete programme before the Christmas vacation, as had been intended originally. It is possible that this lack in continuity may have had some unmeasurable effect.

Twenty-two subjects of the experimental group worked in pairs. To a certain extent the pairs were of their own choosing, although, due to the fact that some subjects were not good readers, it was advised that they worked with a partner who could read well. This was one reason why 'pair' working was chosen; the main reason being that more than one person should be involved in 'learning' the 'brainstorm' technique in the initial stage. The subjects were allowed to change partners, or work on their own where suitable, if their usual partner was absent.

Discussion between the partners was encouraged for the first two Elements of the programme - for Element three they were required to work on their own. They were told to work at their own pace, and not to try and compete with any pair who appeared to be working at a quicker rate.

A brief introductory talk was given to the experimental group a week before they started on the programme. They were told that in the next part of the course they would be learning how to be more creative; and that they

would start by learning how to judge how creative a product was.

The environment in the art room was kept as normal as possible for both the control and experimental groups. The atmosphere was relaxed, as was usual, though the restrictions inherent to the programme may have imposed a slightly different atmosphere to normal.

The control group did the usual type of art work - painting, drawings, ceramics, printing, etc., and the theory work. There was no attempt to play down the importance of original work with the control group, however, as the emphasis on 'originality' is a normal part of the art curriculum. They did not, however, come into contact with the programme as any part of their work.

#### THE 'CREATIVITY PROGRAMME' : THE WORK AND SUBJECTS' COMMENTS

This section deals with the work and comments made by the subjects. These are considered under the headings of the different Elements and Units of the programme, and in the order in which they were administered.

##### Element One: "What is Creativity?"

##### Unit 1. "What is a Creative Product?"

This Unit, probably the most important in the programme, was given to the experimental group. They were instructed to follow the instructions given on the envelope, as closely as possible. As they had not done a programme of this type before, help was given where necessary with any reading difficulties: few needed any such help however.

Owing to the complexity of this first Unit it was decided not to expect all the subjects to complete it in the first period (the usual art 'double-period'), or in any set time; although it was hoped that each Unit, even this first one, would only take about an hour at most to complete. One pair did complete the whole Unit in about forty-five minutes; this is about the time expected for a child of fairly high intelligence to work through the Unit in a conscientious and accurate manner.

The subjects were told that, as they worked through the programme Units, they should not hesitate to ask questions if they felt in any doubt

as to the meanings of some of the instructions. It was felt that such verbal 'feedback' would be of value in any future revision of the programme. There were very few enquiries however, and those that came were mainly from the subjects that had reading difficulties, rather than difficulties in interpretation.

The subjects found this Unit interesting; the slow readers being the exceptions initially, but they became equally interested when they understood what they were expected to do.

For approximately half the subjects the first lesson was sufficient for them to work through the programme for about three or four 'products'. This had been the expectation for the slowest readers prior to the actual administration. Two pairs failed to complete the Unit at the second lesson, though only by one product; and they finished this quickly before starting the next Unit at the next lesson.

The majority of the subjects found the format of the programme easy to use. In this Unit 1 one pair did miss the 'turn to next product' instruction when deciding whether a product was or was not 'original'. This resulted in them giving scores for creativity where none should have been given. A few subjects did ask if they were doing the right thing, and wanted their scores checking as they went along; they were advised to wait until they had completed the scoring, when they would be given all the scores.

Conversation and argument about the various products was enthusiastic - even fierce at times. Some 'bias' was noted when the merits of certain products were discussed. In product two (the house), for example, the subjects tended to score on the basis of personal likes or dislikes, rather than on the basis provided by the criteria specified. This bias was only noted in the case of a minority, however.

The 'sponge' product caused a certain amount of disagreement, as was expected; some thought that the product was a 'copy' i.e. copy of the 'natural'

sponge, although it was man made. The majority of pairs, however, were found to have scored much the same as the 'master score sheet' when the results were examined.

It was noticed, in the majority of cases, that one member of each pair became the dominant partner, and that the partner tended to make the decisions when there was disagreement. This occurred throughout the programme where the subjects worked in pairs.

A note had been made to make sure that all subjects 'showed' their score sheets before they were given the 'master score sheet' to check their judgements. One pair was found to have copied the first few scores from another pair's 'master score sheet' (a pair who had finished quickly). The work was stopped, and the subjects were reminded that, as they were learning to judge and form their own 'opinions', there was nothing to be gained from copying from 'master scores sheets' or each others scores.

The 'water carrier' product was puzzling to a few pairs, and it was necessary to explain to them how it worked.

The 'useless' product (the elephant fence) caused much amusement, and all, except one pair scored this as zero. The pair who did give this product a score, were asked if they really did think it would keep out elephants; they answered that it would not. They appeared to have some difficulty with the 'does it do the job' decision frame of this Unit.

The idea of 'complexity' as a factor in evaluating creativity was not easily scored in some cases, particularly in those products where the complexity was not easily visible, e.g. in the case of the 'radio' product.

Examples of the subjects' responses to Unit 1 are given in the Appendix (pp. 86-89 ).

The majority of the subjects found the comparison with the 'master score sheet' interesting; where their scores did not correspond with the master scores and judgements, a number of pairs were prepared to defend their own



judgements. This had been hoped for as evidence that critical thought processes had been stimulated.

#### Unit 2. "Who is Likely to be a Creative Person?"

The subjects enjoyed working through this Unit; this was expected, as most pupils of this age are keen to 'identify'. Conversations that took place consisted of such phrases as "I'm like that.", "I never do things like that.", or "That's just like you!." They appeared to positively identify with a number of the traits shown in the examples, in the case of a number of the pairs.

The scores obtained were the same as those of the 'master score sheet', with the exception of one pair of subjects; this was the pair who had a certain amount of difficulty in the first Unit. They found a lot of the programme rather hard going; it was noted that both members of this pair were rather low in intelligence, and one of them was also a poor reader. It was suggested that they change partners, but they remained quite adamant in their desire to work together, so it was decided not to press the matter further, but to help them when it was obvious that they required it.

Examples of subjects' responses to Unit 2 are given in the Appendix (pp.90-92).

This Unit, being shorter than most, was finished fairly quickly. As it was easier subject matter, and personally interesting to the subjects, this was expected. A few of the pairs finished the Unit in about thirty minutes; this is perhaps shorter than the average child would need. It was thought that forty to forty-five minutes would be the normal time, judging by the time taken by the majority of the subjects.

The use of humorous drawings in this Unit amused the subjects; it was thought possible that the subjects might not take as much care over the reading due to this. In the event this did not appear to be the case.

A few subjects, who had been absent the week before, completed Unit 1 and worked through Unit 2 in this particular art period. Some who had finished Unit 2 started Unit 3. As each pair was working at its own pace, there was no set period when subjects were expected to complete a Unit. There was no

intention to 'pace' the subjects; although the majority of the pairs did work through the Units in approximately the same time, and by the end of the whole programme administration, those subjects who did finish later than the majority were not more than half an hour behind.

A note was kept of when each pair did complete the individual Units, however, to ensure that each pair did work right through the programme.

Unit 3. "What methods do Creative Persons Use to Produce Creative Products?"

This Unit was short and only intended as a 'link' to the next, more practical, Element in the programme.

This element involved reading or 'covert activity' only. This may account for the fact that the majority of the subjects worked through this element rather quicker than expected.

It was suspected that most subjects did not absorb as much from this Unit as they had from the previous two, though it was not possible to prove this. The subject material was quite difficult, and this, coupled with the fact that no overt response was required in the programme, may have accounted for the apparent superficial approach to the Unit.

As an attempt to ascertain what impact this Unit had, four verbal questions were asked of those pairs who finished very quickly:

1. How did you prepare the mind for creative activity?
2. What methods of thinking, used in creative activity, can you remember?
3. How may the 'solution' to a problem come as a result of creative Thinking?
4. What is the fourth stage in the creative process?

In those cases where satisfactory answers were not given, the subjects were asked to check though the Unit again a little more carefully. When the other pairs saw that the questions were being asked, though they could not hear what the questions were, they slowed a little. The majority of pairs did give satisfactory answers to the question; a few pairs did find it necessary to 'revise' however.

## Element Two: 'Brainstorming'

### Unit 1. "How to Brainstorm"

This section, which was basically intended as a 'reference' section when the subjects were actually learning the 'brainstorming' method by using it, was also a 'covert response' Unit. It was reading matter only, and no sketches were included.

The subjects were a little 'cooler' in their response to this Unit, though, as their interest had been stimulated by Element One, they did settle down to work in a more enthusiastic manner than they normally displayed to material that was 'reading' only.

A few of the subjects needed a little help with the reading, mainly the weak pair referred to previously.

The majority of the subjects thought that the 'brainstorming' method would be useful for solving all sorts of problems. Some subjects, who did not appear to be as involved as they might have been, were asked 'off the cuff' questions to ascertain if they had understood the Unit or to stimulate them to find the answers - e.g. "What is a killer phrase?", or "What is Free-Wheeling?". This only applied to three pairs, and only the rather weaker pair gave unsatisfactory answers.

### Unit 2. "You try some Brainstorming."

As there had been a gap between the administration of Unit 1. and this Unit, due to the Christmas Vacation, Unit 1 was given out again. This had been intended, of course, in the original plan - as a reference - but now the subjects were all asked to read quickly through Unit 1 again before they commenced work on Unit 2. This was done; although, as obviously some read quicker than others it meant that they could not all start the Unit 2 at the same time. As they were not being deliberately paced this was not important. When Unit 2 was administered some pairs were re-arranged due to the absence of normal partners.

The subjects found Unit 2 much more interesting, or appeared to do so,

judging by the way they reacted. As they were more actively engaged in overt responding, any enthusiasm was also more noticable to an observer.

There was much discussion between the partners for both parts of the Unit; this may have accounted for the fewer responses, actually written down, than were expected.

The three problems of Part One were worked first. The problems were timed (five minutes for each), although as different pairs were working on the different problems at different times this was not easy. A clock was set up and the subjects who started later than the majority were asked to time themselves, although they were also kept under observation to check that they did not have longer than intended. The 'master list' was given out when all the subjects had completed the Part One problems.

The results for Part One were, at, first, thought to be rather meagre. Compared to the 'master list', there were only about a quarter of the ideas presented on the sheet of the subjects with the highest number of responses. However, the 'master list' had actually taken nearly six minutes, and had then been rewritten and redrawn - and expanded for the sake of intelligibility - for presentation and comparison. The work of the subjects could not therefore be compared with the total presented on the 'master list'. Another factor that influenced the numbers of the subjects' responses was that they were referring to Unit 1 during the brainstorming of Part 1; also they had no experience whatever of actually using this method before. The subjects were very interested in comparing their results with those on the 'master'. They found that most of the ideas they had thought of were on the 'master list', and those few subjects who had thought of ideas that were not on the 'master' were highly delighted. Motivation for this Part, and for Part Two, appeared to be high.

At the start of the 'brainstorming' on Part One, a few subjects began to use 'killer phrases'; this was discouraged, and they were referred to Unit 1 again where 'killer phrases' were mentioned. Apart from this misuse of

criticism, and the fact that perhaps more ideas were actually thought of than written or drawn - due to the enthusiastic discussion, the 'brainstorming' in both Parts was effective and proceeded as intended.

No reference to Unit 1 was permitted for Part Two. The subjects were told that no 'master list' would be given out after they had finished, but that they could then refer to Unit 1 again to help them select the best ideas from their list. They were told to make a note, if they wished, of their ideas before handing their sheets in, so that they may actually use their ideas.

Part Two was timed, as they all started together on this, but a few pairs asked for a little longer; an extra minute (making six in all) was allowed in the case of those who wished for it.

More responses were produced for this Part Two; this may have been due to the fact they did not have to refer to Unit 1, and they were more used to the 'brainstorming' method. Those pairs who asked for extra time did not hand in sheets with the greatest numbers of responses.

Examples of the subjects' responses to Parts One and Two of Unit 2 are given in the Appendix (pp.93-101).

Although administration of this Unit was not easy, due to the timing factor, the observing of the subjects, collecting 'master lists' after comparison, checking the use of 'killer phrases' etc., the general impression was that the subjects enjoyed 'brainstorming', became highly involved, and motivation was high.

#### The Reminder Leaflet

This was given out immediately on completion of Element Two. The subjects were told to keep these, revise points concerning the 'brainstorming' method for use on the next part of the programme, and refer to them as they wished when doing any 'creative' work or tackling problems at school or at home that looked as if they may have more than one solution.

The Leaflet contained a brief summary of the information contained in Elements One and Two.

### Element Three: "Brainstorm a Painting."

There was only one Unit to this Element, although it was in two sections. The word 'unit' was not included in the heading to this Element, as it may have led to confusion.

The first section, which in effect was the conclusion of the programme, was the 'brainstorming' of the ideas for the painting. The second section was the actual painting, which was performed at the next art period.

The subjects were told that they must now work on their own, and not in pairs; they were allowed to read through it in pairs, to assist the slower readers, but the work had to be individual.

The introduction to this Element reminded them of what they had learned in the other Elements of the programme. They were asked, prior to the administration of this Element, to bring the 'Reminder Leaflet' with them; they were told that they could refer to this while they were working on Element Three, if they wished.

The 'timing' of the first section of this Element was strictly adhered to (twenty minutes for each of the three parts) as the work had to be completed in the allotted art period; also it was desired to observe from the results what could be achieved in a formally structured, individual 'brainstorm' session. This feedback would be useful for future administrations. One further factor was that the subjects would be so involved that they would not have time for influencing each other, or copying.

One or two subjects had some difficulty in understanding what was required of them in the three parts of this first section. These were the poorer readers, and they were helped where necessary during the timed sections, to avoid interfering with other individuals.

The lists of ideas for part one of the first section were a little shorter than hoped for, considering the time allowed. The longest list was good (thirty-two ideas), but the shortest had only four ideas. A list of between thirty and forty ideas had been expected for about fifty per-cent of

the subjects. In the event, an average of approximately twelve responses per subject was found. Examples of subjects' responses to this part and to parts two and three of this section are given in the Appendix (pp.102-110).

The second part of this section - the colour experiments - was enjoyed by most of the subjects, and, in the main, they tackled this well. This part was entirely 'practical' in nature, with the 'brainwork' kept to a minimum.

The work on part three - linking ideas and colour - was found, by the subjects, to be more difficult. The choosing of the most original, yet relevant, idea and combining it with the most appropriate colours is a difficult, sophisticated evaluative process, and to a large extent subjective.

In spite of these difficulties however, the majority of subjects made a good attempt at this. They did find it difficult to put their ideas in concrete form, but when a few of them were questioned at the conclusion of this section, they could describe what they had in mind.

A few subjects wished to have comments made on their efforts in parts one and two before they chose their final combination. It was pointed out that a major part of the creative process was the evaluation of what was creative, and it was essential that they did this evaluation themselves.

The second section - the painting itself - was performed in the next art period. All except one subject, who was absent, completed the painting in the time allowed - approximately one hour. The missing subject performed the painting the next day when he returned. Some of the paintings undoubtedly showed a difference from the subjects' normal work; they may not have been better in a technical sense, but they did show more imagination and an adventurous approach.

Examples of Subjects' paintings are shown in the Appendix (pp.108-110). The administration of the programme was completed by the 27th January 1970.

Creativity Programme Appendix

On completion of the programme an 'appendix' was given to each subject for their own use. This was in the form of 'Hints for Improving your

Creative Power'. The hints were an attempt to make the subjects more aware of the need for critical thought, and the dangers of taking things for granted, as well as indicating the need for increased creative work. Quite a number of the subjects read this as soon as they had been given it, and, from the comments heard, they appeared to find it useful, acceptable, and interesting.

NOTE: A brief statistical survey of the available internal 'feedback' from the programme administration is discussed in Chapter Seventeen (pp.247-254 ).

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## CHAPTER SIXTEEN

### POST-TESTS: ADMINISTRATION

The Post-Tests were administered to the Experimental and the Control groups during March and April 1970. The Complete Timetable for their administration can be seen in the Appendix (p. 3 ).

The post-test battery consisted of those tests - in parallel form where necessary - that had been given to the subjects when they were first year pupils in 1967/68. The details of this administration have been given in Chapters Six and Seven, and reference has been made to this administration in Chapter Fourteen.

The tests were (in the order performed);

- (i) Art Work 1. A 'set' subject - 'The Park'
- (ii) Art Work 2. Own Choice of subject.
- (iii) Torrance Tests of Creative Thinking (Figural Form B) - the TTCT.
- (iv) High School Personality Questionnaire (Form A) - the HSPQ.

The Art Work tests were the same in form as those set for the previous study, three years previously. It was considered whether it might be preferable to set a new subject for Art Work 1, but, on reflection it was thought that this might invalidate comparisons. The subjects were not reminded that they had worked with this title before; in the actual administration only two subjects, in control and experimental groups, remembered that they had done pictures with this title before. Stress was placed, as previously, on the need for 'originality': it was hoped that they would be even more original than they had been in the earlier study.

Form B of the TTCT was used; Form A had been used in the earlier study, and Form B was the equivalent form for retesting.

Form A of the HSPQ was used; the CPQ (the equivalent form for younger children) had been used in the previous study when the subjects had been first year pupils.

### ADMINISTRATION

#### The Art Works

The subjects were informed that they would do two works of art. The first

would be a set subject 'The Park', and that they could choose their own subject for the second work. They would have a double art period (of approximately one hour working time) to complete each work. They were told to think about these works beforehand and, if they wished, to bring sketches or written ideas into the room with them on the day they were to perform the art works.

The control and experimental groups were informed of the work they were to do at approximately the same time. They were further advised that it was in their own interests to keep their ideas to themselves. As the art works were set as part of the normal school examinations, this was an added incentive to secrecy, which would reduce the risk of any contamination that might arise from the sharing of ideas.

The fact that the Art Works were performed in a test situation might inhibit the work of some subjects. It was considered advisable, however, to control the performance conditions as much as possible so that they were the same for all subjects; as was done in the previous administration.

The Art Works were performed by the control and experimental groups in the normal 'art room' environment - allowing for the fact that it was an examination. The few subjects who were absent for the actual exam date performed the work as soon as they returned; no subjects were away for more than a few days, however.

Not many in the control group showed much evidence of prior thought when they performed the art works; more in the experimental group showed that they had, although only a few brought in actual sketches. A few had used 'brainstorming' methods - experimental group only: it had been hoped that a majority would have used this method. It is possible that the time given to the subjects for preparation (about a week) was a little too long, so that they tended to 'leave it till later' and then forgot about it.

The actual work was performed well and quite quickly in the majority of cases, in both the control and experimental groups. There were a few who were

slow or disinterested; some subjects, in both groups, were reluctant to work as hard as they could

There was a slight difference in interest between the 'set' art work and their 'own choice' of subject. Both groups worked with greater enthusiasm on their 'own choice' art work. This is quite normal with this type of subject.

#### Torrance Tests of Creative Thinking (Figural Form B)

These tests were performed in the week following the completion of the art work tests. They were performed in the normal art periods, and the subjects were informed that they were to have some tests similar to those they had done in the first year.

The TTCT was administered according to the instructions in the manual, and no difficulties were experienced. A few subjects requested help with the spelling of some titles; this was given, as allowed for in the instructions.

All the subjects were present, control and experimental groups, when the TTCT was administered. A few subjects appeared a little uninterested but they did complete the work. The majority of subjects worked hard and were enthusiastic, particularly those in the experimental group.

#### High School Personality Questionnaire (Form A)

This test was administered in the week following that of the TTCT. The test was worked through according to the manual, and little difficulty was experienced. Some help was necessary where the American terminology had to be explained. There were only a few occasions when this was necessary, however.

One subject was away from the experimental group when the test was administered. This subject did the test when he returned; being a poor reader, he required more help than usually needed to complete the HSPQ.

All the subjects enjoyed doing this test. A few subjects wanted to know the results of the test. A brief summary of the findings of the test i.e. the Creativity and Exvia scores - and interpretation of their meaning, was given to those subjects who had requested it. Only the more intelligent subjects from the experimental group asked for this information.

The administration of the post-test battery completed the subjects' involvement in the study to test Hypothesis B.

## CHAPTER SEVENTEEN

### POST-TESTS: SCORING AND COMPARISONS: EXAMINATION OF PROGRAMME FEEDBACK

This chapter is divided into three sections:

1. Post-Tests 1970: Scoring. This section deals with the scoring of the TTCT, the HSPQ, and Art Works 1 & 2. Examples, which are shown in the Appendix, are discussed.
2. Comparisons: TTCT and Art Works. 1967/68 and 1970 examples of the TTCT and the Art Works, shown in the Appendix, are compared for increases, decreases and similarities in scoring.
3. Examination of Programme 'Feedback'. Data and examples of feedback from work performed during the administration of the Creativity Programme are considered.

#### SECTION 1. POST-TESTS 1970: SCORING

The scoring of the Post-tests followed the same pattern of scoring as was used for scoring the Pre-tests - those tests that were involved in the study to test Hypothesis A (Chapter Seven). The scoring is discussed under three headings:

Scoring the Creativity Test

Scoring the Personality Test

Scoring the Art Works

Note: The complete scores for each subject in each of the Post-tests, are given in the Appendix (pp. 4-21 ).

#### Scoring the Creativity Test: (TTCT (Figural Test B)

This test was scored according to the Manual for Test B (TTCT, Directions Manual and Scoring Guide, Figural B, Research Edition, January 1968 revision). This was the equivalent Test to the Figural Test A used in the 1967/68 Pre-Tests.

No difficulties were experienced in scoring the TTCT. Examples of subjects' responses to the three Activities that comprise the TTCT, are shown in the Appendix (TTCT Examples: No's 19 - 29, pp. 58-76 ).

As the examples of the 1970 TTCT Post-Tests are intended for comparison purposes, the individual highest and lowest scoring examples for all three Activities are not shown.

The work of subject No.2 (Example 19, Appendix p.58 ), however, shows high Fluency and Flexibility in Activity 3. The work of subject No.40 (Example 28, Appendix p. 75 ) shows high Originality in Activity 1, and the work of subject No.42 (Example 29, Appendix p.76 ) shows high Elaboration in Activity 1. Subject No.42.also scored high in the Totals for the three Activities for Fluency, Originality and Elaboration.

Examples of 'bonus points' for Originality in Activity 3 - ie. where more than one circle is used for a response - can be seen in the work of subjects shown in the Appendix (Examples 19p.58 , 21pp.62-3, 25p.70, and 26pp.71-2 ).

#### Scoring the Personality Test (HSPQ)

Scoring the Personality Tests (HSPQ form A) followed the same procedures as in the 1967/68 administration. The Second Order Factors for 'Creativity' and 'Extraversion' were derived as for the Pre-tests (Chapter Seven). No difficulties were experienced in scoring the Post-test HSPQ.

#### Scoring the Art Works

The same scoring methods were employed as were used in the Art Work judgements in 1967/68 (Chapters Five and Seven). Some improvements in scoring had been considered, but, as the scores for 1970 had to be compared with the earlier scores it was essential to use the same scoring method.

Two judges were used for scoring the 1970 Art Works as a further check on reliability. A different second judge from the one used in the 1967/68 scoring was used. This new judge had no experience of Art Work judging - he was a mathematician - although he had an interest in Art.

The scores for the Art Work judgements are included in the complete scores for all subjects (Appendix pp. 4-21).

Examples of high and low scoring on the four judgements are discussed under the four headings:

Gestalt, Spontaneous, Originality, and Involvement.

Illustrations of the subjects' work are shown in the Appendix (Illustrations No.'s 11 - 20; Appendix pp. 81-84). These illustrations include examples for comparison with the 1967/68 Art Works.

### The Gestalt Judgement

As was found in the scoring of the earlier Pre-test administration, it was easier to score Art Work 1 (the Park) than Art Work 2 (Own Choice); although, perhaps due to the actual works performed, it was not as difficult to score the 1970 Art Work 2 as it was to score the 1967/68 Art Work 2.

High scores on the Art Work 1 judgement were achieved by subjects No.19 (illustration 12, Appendix P.81 ) No.42. (Illustration 18) and No.32 (Illustration 20).

High scoring in Art Work 2 was achieved by subject No.40 (Illust 14).

Low Scoring in Art Work 2 was achieved by subject No.24 (Illustration 16).

### The Spontaneous Judgement

Care was taken to be as objective as possible when judging this factor. The scoring criteria were followed closely. The opposite poles of the Spontaneous/Deliberate continuum were carefully considered; no reversals of polarity were necessary for the 1970 scoring, as had been necessary in the 1967/68 scoring (see Chapter Seven).

High Spontaneous scoring in Art Work 1 was achieved by subject No.19 (illustration 12); fairly high scoring in Art Works 2 can be seen in the work of subject No.18 (Illustration13).

Low scoring in Art Work 1 (i.e.high Deliberate scoring) was achieved by subject No.7 (Illustration11), and in Art Work 2 by subjects No.23 (Illustration 15), and No.24 (Illustration 16).

### The Originality Judgement

Each Art Work was judged on the seven factors - Theme, Use of Work Space, Use of Surface, Variety, Rhythm, Use of Media, and Impact on Judge - as in the previous scoring (Chapters Five and Seven). Little difficulty was experienced in the scoring, although, as with the scoring of the Pre-tests, scoring Factor 1 (Interpretation of Theme) was found less easy than the other factors. A quick 'run through' the Art Works was necessary to establish a 'norm' so that the 'unusual' could be detected. The second judge also found this judgement factor more difficult, though not unduly so.

High scores in originality were obtained in Art Work 1 by subjects No. 19 (Illustration 12), No.42 (Illustration 18), and No.32 (Illustration 20). High scoring in Art Work 2 was achieved by subjects No.18 (Illustration 13), & No 40. (Illustration 14).

An example of low Originality scoring in Art Work 2 is that of Subject No.24 (Illustration 16).

#### The Involvement Judgement

As in the scoring of the Pre-tests, the Involvement judgement was found to be more difficult than that of the Originality judgement, although it was easier in the 1970 scoring than in the 1967/68. The Involvement Judgement was scored on the five factors - Life, Animation, Emotion, Media, and Effect of Media - as previously described (Chapters Five and Seven). The most difficult factor to score was, as was found previously, factor 5 (Effect of the Media), although factor 3 (Emotion) presented problems in the case of the work of a few subjects.

High Involvement in Art Work 1 was achieved by subjects No.19(Illust.12) No.42 (Illustration 18), and No.32 (Illustration 20). Fairly high Involvement in Art Work 2 was noted in the case of subjects No.18 (Illustration 13), and No.40 (Illustration 14).

Examples of low Involvement in Art Work 2 are those of subjects No.23 (Illustration 15), and No.24 (Illustration 16).

There were, therefore, no major difficulties that arose in scoring of the 1970 Post-test Art Works 1 & 2, on the four judgements - Gestalt, Spontaneous, Originality, and Involvement. The second judge also reported that he had found few difficulties.

#### SECTION 2 COMPARISONS OF EXAMPLES OF THE TTCT AND THE ART WORKS

This section deals with comparisons between work done in the TTCT and Art Work Pre-tests (1967/68) and Work done in the TTCT and Art Work Post-tests (1970) Increases, decreases and similarities are discussed.

The scores for the subjects' work used as examples are included in the complete scores in the Appendix (pp. 4-21).

## TTCT Comparisons

The following table shows comparisons of the three Activities of the TTCT. The Examples referred to are shown in the Appendix (TTCT Examples, numbered 1 - 29, Appendix pp. 22-76).

### TTCT: COMPARISONS TABLE

#### KEY TO ABBREVIATIONS

- Incr = Increase in scoring from 1968 to 1970  
 Decr = Decrease in scoring from 1968 to 1970  
 Stat = Static: similar scoring in 1968 and 1970  
 Sl = Slight  
 FLUE = Fluency  
 FLEX = Flexibility  
 ORIG = Originality  
 ELAB = Elaboration

#### TTCT: COMPARISONS TABLE Cont.....

Example No.		S's No.	ACTIVITY No	COMPARISONS
1968	1970			
14	22	14	1	Decr ORIG ELAB
18	28	40	1	Incr ORIG ELAB
7	29	42	1	Decr ORIG: large Incr ELAB
15	24	19	2	Stat FLUE FLEX ORIG: Sl Decr ELAB
17	27	33	2	Decr FLUE FLEX ORIG: Incr ELAB
6	23	15	2	Decr FLUE FLEX ORIG: Sl Incr ELAB
12	19	2	3	Incr FLUE FLEX ORIG ELAB
13	20	6	3	Decr ELAB
4	21	9	3	Incr ORIG ELAB
3	25	23	3	Incr FLUE FLEX ORIG ELAB
16	26	30	3	Decr FLUE FLEX ELAB: Sl Decr ORIG

Some comments on the above comparisons, with reference to the examples of particular subjects, indicate points of interest.



The 'bonus originality' points were obtained by subject No.2 (Examples 12 & 19) in 1968 and 1970, but he still increased his scores in Fluency and Flexibility.

In the case of subject No.9 (E.g.'s 4 & 21) the increase in Originality was due to the combinations giving 'bonus originality' points, but Fluency and Flexibility have suffered. This is also due to the increase in Elaboration, which affects the time factor. There is an obvious increase in creative ability however.

For subject No.14 (E.g.'s 14 & 22), although the quality of the responses appear similar in 1968 and 1970, Fluency, Flexibility, and Originality have suffered as a result of fewer responses and less original ideas (according to the Manual scoring directions).

The responses of subject No.19 (E.g.'s 15 & 24) illustrate similar responses in 1968 and 1970, although lower Fluency has resulted in slightly lower Originality and Elaboration.

The increases noted in the case of subject No.23 (E.g.'s 3 & 25) are exceptional - partly due to the 'bonus originality' points in combining circles in Activity 3.

In the case of subject No.33 (E.g.'s 17 & 27) the increase in Elaboration is mainly due to the decrease in Fluency.

The increase in Originality and Elaboration is easily seen in the responses of subject No.40 (E.g.'s 18 & 28).

One type of anomaly due to the scoring 'rationale' in the Directions Manual is illustrated in the case of subject No.42. (E.g.'s 7 & 29). Her Originality score is 4 in 1968 - where she has drawn a 'space ship' - but is 0 in 1970 - where the response is a 'sausage'. The response in 1970, however, would appear to be as 'original', if not more so, than the 1968 response. Also, Elaboration has increased considerably.

In general, however, the scoring method for the TTCT is satisfactory and appears reliable.

### Art Work Comparisons

Of the eight works from the 1970 Post-test Art Works that are illustrated, only two are directly compared with the same subjects' work from the 1967 Pre-tests. Illustrations are shown in the (Appendix pp. 77-84 ).

The work of subject No.42. in Art Work 1 (The Park), shows an increase in scoring in the Gestalt, Spontaneous, Originality, and Involvement judgements from 1967 (Illustration 17, Appendix p. 83 ) to 1970 (Illustration 18;p. 83 ) As can be seen from the Illustrations this subject has speeded up her performance from 1967 to 1970.

The work of subject number 32, also in Art Work 1, shows a marked increase in scoring in the Gestalt, Originality, and Involvement judgements from 1967 (Illst.19. p. 84 ) to 1970 (Illust.20. p. 84 );although only a slight increase in Spontaneity was scored. The difference is particularly marked in this subject's approach; there is a distinct lack of 'life' and involvement in the theme and execution of the 1967 painting, compared with the action and personal integration and involvement in the 1970 painting.

Other 1970 works are of interest and, although not directly compared with the 1967 Art Works, illustrate points noted in the Art Work judging.

Art Work 2 performed by subject No.40 (Illust.14, p. 82 ) achieved a high increase in scoring from 1967 to 1970 in the Gestalt and Originality judgements, a lesser increase in the Involvement judgement, and similar scoring in the Spontaneous judgement. The picture itself is interesting from the 'abstract' point of view, and the title of the work 'The Squares of Life' would appear to indicate that a strong personal 'symbolism' is involved.

The 1970 Art Work 2 of subject No.18 (Illst.13, p. 82 ) shows identical scoring in the Gestalt, Originality, and Involvement judgements, but an increase in Spontaneous scoring compared to 1967 work.

The work of subject No.19 achieved similar scoring in Art Works 1 & 2 in 1967 and 1970. The 1970 Art Work 1 (Illust.12, p. 81 ) is an example of her work.

Art Work 1 1970 (Illust.11, p. 81 ) illustrates the work of subject No.7 who appeared to increase scoring in 'Deliberateness' (i.e. lower Spontaneity) from 1967 to 1970, although with this particular work he also achieved his highest Gestalt and Originality scores.

In conclusion, the Art Work 2 of subject No.24 (Illust.16,p. 83 ) - used as an example of low scoring in the Gestalt, Spontaneous, Originality, and Involvement judgements - achieved the lowest scoring in his 1967 and 1970 Art Works 1 and 2 performances, except for his 1967 Art Work 2 Involvement score, which was one compared to the two he achieved in the work shown in the illustration.

### SECTION 3. EXAMINATION OF PROGRAMME 'FEEDBACK'

The Creativity Programme 'feedback' is concerned with the 'internal' assessment of the programme, and not with the study to test Hypothesis B. It is more appropriate, therefore, to discuss the feedback at this point rather than to confuse feedback scores with the 'test' data analysis in the final part of the thesis.

This feedback consists of the 'overt' responses made by the experimental group subjects as they worked their way through the Creativity Programme. Overt responses were obtained from the following Elements and Units of the Programme:

Element One:	Unit One:	"What is a Creative Product?"
	Unit Two:	"Who is Likely to be a Creative Person?"
Element Two:	Unit Two:	"You try some Brainstorming"
Element Three:		"Brainstorm a painting"

The feedback is examined under headings that correspond to the above Elements and Units.

Examples and Illustrations of the responses are shown in the Appendix (pp.85-110). Tables of relevant data are included in the text.

#### Element One: Unit One: "What is a Creative Product?"

The data on Table 17:1a (next page) includes the scores - Product Score and Verbal Score for each pair of subjects.

TABLE 17:1a PROGRAMME FEEDBACK: SUBJECTS' SCORES

The scores of subjects' responses to Element One: Units One & Two, and Element Two; Unit Two, are given in full.

The Pair Numbers and the Subject's Numbers are also included.

Where a 'Master Score Sheet' was provided, the 'Master Scores' are also included for comparison.

ELEMENT ONE: UNIT ONE (JUDGING THE CREATIVE PRODUCTS)

PRODUCT SCORES		PRODUCT NUMBERS									
		1	2	3	4	5	6	7	8	9	10
MASTER SCORES		7	9	1	7	10	4	8	0	5	6
PAIR No.	SEX										
1	M	6	7	1	7	4	5	8	0	5	7
* 2	M	7	7	5	7	7	1	4	0	4	5
3	M	7	9	1	7	9	4	4	1	5	6
* 4	M	6	10	4	7	10	4	5	0	5	6
5	M	7	10	7	9	9	6	7	0	7	8
6	F	8	8	1	7	6	1	6	0	6	6
7	F	8	9	1	7	7	1	7	0	6	6
8	F	7	9	1	7	8	2	6	2	5	5
* 9	F	7	7	1	6	8	6	6	0	5	4
10	F	7	8	1	7	8	6	7	0	6	4
*11	F	8	7	7	1	1	3	8	8	7	7
S's Average		7.1	8.3	2.7	6.5	7.0	3.5	6.2	1.0	5.5	5.8

VERBAL SCORES (1 point for each 'verbally correct' answer)

		PRODUCT NUMBERS										TOTAL
PAIR No.		1	2	3	4	5	6	7	8	9	10	
1		1	0	1	1	0	0	1	1	1	1	7
* 2		1	0	0	1	0	0	0	1	0	1	4
3		1	1	1	1	1	1	0	0	1	1	8
* 4		1	1	0	1	1	1	0	1	1	1	8
5		1	1	0	0	1	0	1	1	1	1	7
6		0	1	1	1	0	0	0	1	1	1	6
7		0	1	1	1	0	0	0	1	1	1	6
8		1	1	1	1	1	1	0	0	1	1	8
* 9		1	1	1	1	1	1	0	1	1	0	8
10		1	1	1	1	1	0	0	1	1	0	7
* 11		0	0	0	0	0	1	1	0	1	1	4

% correct 66.4

73

\* = Examples of responses in the Appendix (pp.86-89)

The average scores for each product show that there is considerable agreement with the Master Scores, except in the case of product No.5 ( the abstract painting). The low agreement here is probably due to the 'personal' likes or dislikes conflicting with objective judgement.

The scores of pair No.11 tend to influence the averages in the case of a number of products; this pair, as has been noted previously, had a certain amount of trouble throughout the programme. Examples of the scoring in this Unit are given in the Appendix (pp. 86-89 ) for pairs No.2, 4, 9, and 11.

The Verbal judgement scores reveal that a 66.4% agreement with the Master Judgements was achieved. As the Product Judgements were relatively subjective this error rate is not unacceptable; the subjects were encouraged to think for themselves, and disagree with the Master Judgement Scores if they had reason to do so.

Element One: Unit Two "Who is Likely to be a Creative Person?"

Table 17:1b (next page) shows the scores for judging the 'creative person'. There was a low error rate for this Unit's responses - 90.9% correct. This was to be expected as the judgements were reasonably objective, and the 'written portraits' of the six individuals were constructed so that identification was easy.

The error rate would have been lower still but for the responses of pair No.3 (Appendix Example p. 90 ). This pair had a lower error rate in Unit One, and it is difficult to account for their high error rate in judging the creative person. The responses of subject pairs No's 6 and 9 (Examples pp. 91-92 ) are more typical of the responses to this Unit Two.

Table 17:1b also includes the pair compositions for Element One, Units One and Two.

Element Two: Unit Two "You try some Brainstorming"

Table 17:1c (page after next) shows the number of responses given for parts 1 and 2 of the 'brainstorm' unit.

The Master Brainstorm Sheet contained many more ideas than were expected from the subjects: more time had been taken in its preparation than was

TABLE 17: 1b PROGRAMME FEEDBACK: SUBJECTS' SCORES (Continued..)

## ELEMENT ONE: UNIT TWO (JUDGING THE CREATIVE PERSON)

		STORY NUMBERS						TOTAL
		1	2	3	4	5	6	
MASTER ANSWER		NO	YES	YES	NO	NO	YES	6
PAIR No.	SEX							
1	M	0	1	1	1	1	1	5
* 2	M	1	1	1	1	1	1	6
* 3	M	1	1	0	0	0	0	2
4	M	1	1	1	1	1	1	6
5	M	1	1	1	1	1	1	6
* 6	F	1	1	1	1	1	1	6
7	F	1	1	1	1	1	1	6
8	F	1	1	1	1	1	1	6
* 9	F	1	1	1	1	1	1	6
10	F	1	1	1	1	1	1	6
11	F	1	1	1	0	1	1	5
% Correct 90.9		Average 5.45						60

\* = Example of responses in the Appendix (pp.90-92)

## PAIR COMPOSITION: PAIR AND SUBJECT No's

## ELEMENT ONE: UNITS ONE AND TWO

PAIR NUMBER	SEX	SUBJECT 1	SUBJECT 2
1	M	22	23
2	M	29	32
3	M	28	31
4	M	24	30
5	M	25	26
6	F	38	39
7	F	36	41
8	F	37	43
9	F	40	45
10	F	35	42
11	F	33	34

TABLE 17:1c PROGRAMME FEEDBACK: SUBJECTS' SCORES (Continued...)

ELEMENT TWO: UNIT TWO: BRAINSTORMING (PARTS ONE AND TWO)

The subjects 'brainstormed' three problems in Part One (where reference to Unit One was permitted, and a 'Master Brainstorm Sheet' was provided), and three problems in Part Two (where no reference or comparison was available).

The expectation for the number of ideas for solving each of the problems was between 10 & 15 (I.E. 60 - 90 for the six problems).

When this Unit was administered some pairs were re-arranged, due to absences. A table of re-arranged pairs is included.

		BRAINSTORM PROBLEM NUMBERS						
		PART ONE			PART TWO			TOTAL
PAIR No.	SEX	1	2	3	1	2	3	
1	M	8	15	7	-	11	-	41
2	M	6	12	10	8	4	4	44
* 3	M	3	7	10	3	3	2	28 (low)
4	M	7	6	5	5	11	-	34
5	M	3	13	6	12	5	4	43
6	F	5	5	7	6	3	9	35
* 7	F	6	13	15	18	17	9	78 (high)
* 8	F	2	4	10	8	5	7	36 (low)
9	F	10	12	11	13	17	7	70
10	F	9	13	11	14	18	10	75
11	F	5	11	5	12	19	4	56
S's Averages		5.8	10.1	8.8	9.1	10.3	6.2	49.1

PAIR RE-ARRANGEMENT: Subjects No's

PAIR NO.	SEX	SUBJECT 1	SUBJECT 2
1	M	22	28
* 3(!)	M	31	-
4(?)	M	24	30
5	M	23	25
6	F	34	39
11	F	33	38

- \* = Example of responses in the Appendix (pp.93-101)  
 (!) = Worked solo when returned to school.  
 (?) = No.26 joined this pair (he was 'spare' on the day concerned).

allowed the subjects, and the ideas had been 'expanded' for comprehension purposes. It was expected, however, that subjects would produce 10 to 15 ideas per pair for each problem in Parts 1 and 2.

As can be seen from the data, few subjects managed to reach this level. Possibly, the expectation was too high, or a longer time should have been allowed for brainstorming each problem. Part 1 was intended for 'practice' but, apart from the responses to the first problem in Part 1, there was little difference in the average number of responses from Part 1 to Part 2: in fact the average number of responses to problem three was lower in Part 2.

As can be seen in Table 17:1c, due to absences some rearrangement of the pair components was necessary when this Unit was administered. Pair No.3, for example, consisted of one subject only who returned when all the other subjects had completed the Unit. This subject's scores were lowest obtained; this may indicate that brainstorming may be more effective in pairs than solo, but scores from one subject cannot provide evidence for this postulate.

The responses of high scoring pair No.7 and low scoring of pair No.8 together with pair No.3's responses are shown in the Appendix (pp. 93-101 ).

#### Element Three: "Brainstorm a Painting"

Table 17:1d (next page) shows the choice of theme and the numbers of ideas in the written responses to part 1 of the brainstorming for the painting. The subjects worked as individuals for this Element (One Unit only) Examples of the written responses, Illustrations of two responses to the 'media experiments' of part 2, and selected finished paintings can be seen in the Appendix (pp.102-110).

It is of interest to note that only four subjects chose 'Joy' as a theme, four chose 'Misery', and the remaining subjects chose 'Fear'. The male written responses were often concerned with 'horror story' type situations, and often did not relate to the subjects' personal experience; the written responses of subjects No.30 and 32 (Appendix pp.102-3) are typical. The female subjects, on the other hand, tended to respond on a 'personal experience' basis, the examples of subjects No.40, 42, and 45 (Appendix pp.104-7) illustrate this.



TABLE 17:1d PROGRAMME FEEDBACK: SUBJECTS' SCORES (Continued...)

ELEMENT THREE (BRAINSTORMING THE 'PAINTING')

The 'Painting' was brainstormed by each subject individually. The number of 'written responses' concerning each subject's choice, and the particular choice made, are given here.

SUBJECT'S No.	SEX	CHOICE	NUMBER OF IDEAS
22	M	Fear ?	5
23	M	Joy	12
24	M	Fear	4 (low)
25	M	Joy	8
26	M	Fear	8
28	M	Fear	10
29	M	Fear	9
* 30 "	M	Fear	14
31	M	Fear	4
* 32 "	M	Fear	21
33	F	Joy	7
34	F	Fear	12
35	F	Misery	15
36	F	Joy	11
37	F	Fear	13
38	F	Fear	5
39	F	Fear	17
* 40 "	F	Misery	18
* 41 "	F	Fear	11
* 42 "	F	Misery	32 (high)
43	F	Fear	10
* 45 "	F	Misery	23

Average No. of Responses 12.23

CODES: (?) = Choice not certain, as no title given.

\* = Example of written response in Appendix (pp.102-107).

" = Example of final painting shown in Appendix (pp.108-110).

NOTE: Subjects 27 and 44 had left, and were not included in the Study to Test Hypothesis B.

The average number of written responses was 12.23. The lowest number of responses was four - subject No.31 - and the highest was thirty-two - subject No.42.

The responses to the 'Media experiments' were not as varied as was expected; all the subjects chose paint, although other media was available. The examples chosen (Subjects No.40 and 42, Appendix pp.109-10) are typical. The subjects, on the whole, did utilize some of the media experiments in their final paintings.

It was felt that the paintings produced, for the final session of this last Programme Element, were more creative than the normal work produced by the subjects. The six examples illustrating the finished paintings of subjects No's, 30, 32, 40, 41, 42 and 45 (Appendix pp.108-10) show various approaches.

#### CONCLUSION

To a certain extent the programme appeared satisfactory, from the point of view of the 'internal' examination. The 'feedback', and points noted in the administration (Chapter Fifteen), however, indicate areas where some improvements might be made.

The error rate in the Product Judgement Unit could be reduced; probably by making the language simpler and instructions clearer, also by giving more information on the Product Cards. More time for 'brainstorming' each problem in Element Two: Unit Two may be advantageous.

Making provision for some 'overt' responses to Element One: Unit Three "What Methods do Creative Persons Use to Produce Creative Products?", and Element Two: Unit One "How to Brainstorm" may also improve the effectiveness of the Creativity Programme.

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CHAPTER EIGHTEEN

DATA PROCESSING

The Data were obtained from:

- (a) The Pre-Test administration in 1967/68
- (b) The Post-Test administration in 1970: also included were the second judge's scores for the 1970 Art Work judgements.

Tables of the Complete Raw Scores for all the Subjects in all the Test items are included in the Appendix (Appendix Part Two pp. 4 - 21): main judge's scores only.

1. CHOICE OF STATISTICAL METHODS FOR ANALYSES OF DATA

The analysis of the data was divided into two main areas:

- (A) CORRELATIONS: (1) Matrix Correlations, as for the study to test Hypothesis A, and (2) Interjudge Correlations on the Art Work Judgements.

- (B) ANALYSIS OF THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS:

this being the main area for testing Hypothesis B.

(A) CORRELATIONS

(1) It was decided to obtain intercorrelations for all the scores of those subjects remaining in the study who had performed all the test items in both the 1967/68 and 1970 administrations. These subjects were involved in the research as members of the Control Group or the Experimental Group.

Correlations obtained for the 1967/68 Data (when the subjects were 1st Years) would be compared with the 1970 Correlations (when the subjects were 3rd Years). In addition Correlations for the 1970 Data would provide a further check on the validity of the TTCT as a measure of creativity in the visual art field. It was also decided to see if there was a reoccurrence of the pattern of correlations found in the study to test Hypothesis A when more correlations were found with 3rd Year subjects than were found with 1st Years.

Only the Originality and Elaboration factors of the TTCT had been

included in the correlations when testing Hypothesis A (as Fluency and Flexibility do not appear in the scoring of all the TTCT Activities). In the study to test Hypothesis B it was decided to include the scores for Fluency and Flexibility to complete the study.

(2) Interjudge Correlations would also be performed for the 1970 Data (from the main judge and the second judge) to check the reliability of the Art Work judgements. The same formula would be used as was used for the Interjudge Correlations in the study to test Hypothesis A (1967/68).

#### (B) ANALYSIS OF THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS

The selection of the method of analysis for testing the significance of the difference between means presented problems in the present study. In ideal experiments groups can be selected so that they are matched as closely as possible with regard to numbers, ability, sex etc. In the prevailing circumstances this was not possible. The experiment had to be carried out with the subjects in their normal classes in the normal school timetable in their normal environment. This implies that the results of any analysis, however significant, must be treated with reservations.

Examination of the Data revealed the following factors:  
Control and Experimental Groups, Male and Female subjects, Scores from Year One (1967/68) and Year Two (1970), and Twenty Four Test Items.

A frequently used test of the significance between means is the 't' test. Should the 't' Test be used in the present case, however, a great number of separate 't' Tests would be needed. Apart from the number of the calculations involved, there would be serious objections to relying solely upon 't' Tests in the present study. A number of 't' Tests would be likely to show significant results 'by chance': as Guilford (1965) has stated "...if we happened to have as many as a hundred differences to be tested, and if we found one of them significant at the .01 level and approximately five of them significant at the .05 level, we should actually conclude that none of the differences is significant. We could even have

a few more than these meeting the significance standards due to chance." A more reliable statistical test must be used in the initial stages in the present research.

The most suitable instrument, which can handle all the data and be adapted to cater for data with unequal N's, would appear to be the Analysis of Variance.

Various methods of analysis for groups with unequal N's were examined, including Snedecor's (1956) methods of providing missing data (only useful if there were a very few differences in numbers between the groups), which were found to be inapplicable in the present case.

Methods of discarding Data to yield equal N's were considered, but as Edwards (1968) states "... in order to obtain equal N's for all the treatments, we might have to discard relatively a large number of observations from each of the other  $k - 1$  treatments. Not only would this result in a loss of accuracy of the treatment means for which we have discarded observations, but it would result in a loss of degrees of freedom for our estimate of experimental error." Such is obviously the case in the present study, which is why methods of analysis for unequal N's were considered necessary.

After examination of the various methods of analysis it was decided to perform a  $2 \times 2 \times 2 \times 24$  Analysis of Variance (ANOVA) for unequal N's with repeated measures on the last two factors.<sup>1</sup> I.e. the year factor is repeated (year 1 and year 2) and the tests are repeated. A table showing this type of ANOVA is shown in Winer (1970: p.350). This method was adopted together with the method for unequal group size (unweighted means) also given by Winer.

An ANOVA of this type should give an indication as to whether the Null Hypothesis should be accepted or rejected (i.e. rejected if any of the F's obtained are significant at the .05 level). If rejected further tests would be necessary where significant main effects or interactions were revealed.

Should the Null Hypothesis be rejected on the evidence of the

Overall ANOVA, it was decided to do a further series of ANOVA'S. Each test item would be analysed using a  $2 \times 2 \times 2$  ANOVA for unequal N's. The ANOVA to be used was based on that given by Edwards (1968). Should significant results be found in these ANOVA's it would be possible to apply further testing procedures to investigate the significance of the differences between means.

<sup>1</sup> The point is often made that methods of statistical analysis should be chosen before the data have been obtained. Guilford (1965) states "Experimental designs... have not been generally so consciously considered or so well planned as when the experimenter knows that analysis of variance is to be used." This is true in research where the experimenter can keep most variables constant. In field research in normal school conditions it is not possible to plan ahead for a period of three years and control the variables.

It was therefore decided to choose the most appropriate method for analysing the data when it had been obtained; although various methods of testing the significance between means had been considered beforehand; including Analysis of Variance.

## 2. DATA PROCESSING: CALCULATION METHODS

The methods of calculation are considered in two sections:

- A. Correlation methods: (i) Matrix Correlations; (ii) Interjudge correlations.
- B. Methods for finding the significance of the difference between means:  
(1)  $2 \times 2 \times 2 \times 24$  ANOVA, (ii)  $2 \times 2 \times 2$  ANOVA's, and (iii)  $1 \times 1$  (one-way) ANOVA's, 't' Tests and Non-Parametric Tests.

### A. CORRELATIONS METHODS

#### (i) Matrix Correlations

A programme was obtained (produced by the Keele Computer Centre) for a Correlation Matrix (also providing means, s.d. & z scores). The Data was then computer processed and hand checked (samples) to check the accuracy of the programme.

#### (ii) Interjudge Correlations

These correlations were computer processed using a programme based on the same formula that had been used to obtain the Interjudge correlations in the study to test Hypothesis A. i.e. a product-moment method of calculating  $r$  from ungrouped original scores.

## B. METHODS FOR ANALYSIS OF THE SIGNIFICANCE BETWEEN MEANS

### (i) 2 x 2 x 2 x 24 ANOVA

This Overall ANOVA (based on the methods shown by Winer) for unequal N's and repeated measures on the last two factors, was performed by the author. As a computer programme would have taken a long time to prepare this was hand processed using a calculator.

### (ii) 2 x 2 x 2 ANOVA's

While the overall ANOVA was in progress the computer programme to perform the 2 x 2 x 2 ANOVA's was prepared. Should any of the main effects or interactions examined in the overall ANOVA Prove significant the 2 x 2 x 2 ANOVA would be used. It was considered worthwhile doing this as it appeared likely that the Null Hypothesis would be rejected in certain areas.

It was originally intended to process only those tests that appeared to warrant further investigation. In the event the computer programme was finished first so the data were processed whilst the overall ANOVA was in progress. The results were not examined or analysed, however, until the overall ANOVA was finished and analysed.

### (iii) 1 x 1 (One-way) ANOVA's and other tests

One-way ANOVA's were performed on the Data where the significant results of the three factor ANOVA indicated further investigation would be appropriate. 't' Tests were performed in a few instances as a further check. Where the homogeneity of the variance was in any doubt the F Max test was also applied. In one instance the F was found to be significant, and a Non-Parametric test was used as a further check. The results were found to be similar in all tests of significance that were used.

The Non-Parametric tests were also used as a check in the case of a few other tests. The Non-Parametric tests used were the Wilcoxon Matched-Pairs Signed-Ranks Test and the Mann-Whitney U Test. The results of these tests are shown in Table 19:5 (p. 274 ).

The One-way ANOVA's, 't' Tests and Non-Parametric Tests were performed by hand using a calculator.

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## CHAPTER NINETEEN

### ANALYSES OF DATA: RESULTS

The analyses of the data are discussed in four sections:

SECTION ONE: CORRELATIONS

SECTION TWO: INTERJUDGE CORRELATIONS

SECTION THREE: SIGNIFICANCE OF THE DIFFERENCES BETWEEN MEANS

SECTION FOUR: BRIEF SUMMARY OF ALL ANALYSES

#### SECTION ONE: CORRELATIONS

The correlations performed on the data for the CPQ/HSPQ, the TTCT and Art Works 1 and 2, Males and Females, in 1967/68 and 1970 were examined for correlations that were significant at the  $p \leq .05$  and  $P \leq .01$  levels using a 'one-tail' test for  $p$  (Edwards: 1968) as positive correlations were expected.

The correlations between the Art Works and the CPQ/HSPQ & TTCT, that reached the chosen levels of significance are shown in Tables 19:1A (p. 261 ) and 19:1B (p. 262 ). Tables of correlations for selected groups and tests are shown in the Appendix (Appendix Part Four: Tables 8a - 12b) pp.123 - 128).

The analyses of the correlations are discussed under five headings:

- 1 Art Works and Creativity Test (TTCT)
- 2 Art Works and Personality Test (CPQ/HSPQ)
- 3 Creativity Test (TTCT) and Personality Test (CPQ/HSPQ)
- 4 Intercorrelations: Art Works
- 5 Intercorrelations: Creativity Test (TTCT)

A summary of the findings concludes this section.

#### 1 Art Works and Creativity Test (TTCT)

Tables 19:1A and 19:1B show the correlations for 1967/68 and 1970 between the Art Works and the TTCT that were found to be significant at the chosen levels.

As was found in the previous study to test Hypothesis A, a relationship was apparent between the Art Works and the TTCT: particularly for the TTCT



TABLE 19:1A CORRELATIONS: CPQ/HSPQ, TTCT AND ART WORKS: FOR 1967/68 FOR THOSE SUBJECTS INVOLVED IN STUDY B: IN 9 GROUPS

CPQ/HSPQ, Creativity and Exvia; TTCT Acts 1, 2, 3, and Total for Fluency, Flexibility, Originality, and Elaboration with Art Works 1 and 2 for Gestalt, Spontaneous, Originality and Involvement.  
CODE: For Art Works G = Gestalt, S = Spontaneous, O = Originality, I = Involvement. Significance levels  
G S O I p ≤ .05, G S O I p ≤ .01

1967/68	N	ART WORK	PERSONALITY		TTCT (TORRANCE TESTS OF CREATIVE THINKING)					
GROUP			CPQ		ACT 1		ACT 2			
			CREA	EXVIA	ORIG	ELAB	FLUE	FLEX	ORIG	ELAB
ALL SUBJECTS	41	1 2			I	G O I		I		G O I O I
ALL MALES	21	1 2				G O I I			S	G I I
ALL FEMALES	20	1 2			G O I					-s <sup>O</sup>
CONTROL	19	1 2				G O I G O I				O I G O I
CONTROL MALES	11	1 2				I I				I G O I
CONTROL FEMALES	8	1 2				O I				
EXPT	22	1 2			G I I		I	I		
EXPT MALES	10	1 2	-O G	G O I	G	G I	-G	G I	G	G
EXPT FEMALES	12	1 2								

1967/68	N	ART WORK	TTCT (TORRANCE TESTS OF CREATIVE THINKING)							
GROUP			ACT 3				TOTALS			
			FLUE	FLEX	ORIG	ELAB	FLUE	FLEX	ORIG	ELAB
ALL SUBJECTS	41	1 2				$\frac{0}{0} \frac{I}{I}$				$G \frac{0}{0} \frac{I}{I}$
ALL MALES	21	1 2			S	$G \frac{I}{I}$			S	$G \frac{I}{I}$
ALL FEMALES	20	1 2				-S				-S <sup>0</sup>
CONTROL	19	1 2				$\frac{0}{I}$			S	$G \frac{0}{0} \frac{I}{I}$
CONTROL MALES	11	1			S	G			S-0	$G \frac{I}{0} \frac{I}{I}$
CONTROL FEMALES	8	1 2								
EXPT.	22	1 2	I	I		$\frac{I}{I}$	I	I		
EXPT. MALES	10	1 2	G I	G I	G	$\frac{I}{I}$	G I	G I	$\frac{0}{I}$	G I
EXPT. FEMALES	12	1 2		-S						

TABLE 19: 1B CORRELATIONS: CPQ/HSPQ, TTCT AND ART WORKS; FOR 1970 FOR THOSE SUBJECTS INVOLVED IN STUDY E; in 9 GROUPS

CPQ/HSPQ Creativity and Exvia. TTCT Acts 1, 2, 3, and Total for Fluency, Flexibility, Originality, and Elaboration with Art Works 1 and 2 for Gestalt, Spontaneous, Originality and Involvement.  
CODE: For Art Works G = Gestalt, S = Spontaneous, O = Originality, I = Involvement. Significance levels  
G S O I p ≤ .05, G S O I p ≤ .01

1970 GROUP	N	ART WORK	PERSONALITY HSPQ		TTCT (TORRANCE TESTS OF CREATIVE THINKING)					
			CREA	EXVIA	ACT 1		ACT 2			
					ORIG	ELAB	FLUE	FLEX	ORIG	ELAB
ALL SUBJECTS	41	1 2	-S-O	S		<u>G S O I</u> <u>G O I</u>		-G -O-I -I		<u>G O I</u> <u>G O I</u>
ALL MALES	21	1 2	-S	S	O <u>G O</u>	<u>G O I</u> <u>G O I</u>		-I -I		<u>G O I</u> <u>G O</u>
ALL FEMALES	20	1 2				<u>G O I</u> <u>O I</u>			G	<u>G O I</u> <u>O I</u>
CONTROL	19	1 2			O	<u>G O I</u> <u>G O I</u>	-O-I	-G -O-I -I	-G-O-I	<u>G O I</u> <u>G O I</u>
CONTROL MALES	11	1 2	G I I		G O	<u>G O I</u> <u>G O I</u>	S	S-O-I	<u>S</u>	<u>G O I</u> <u>G O I</u>
CONTROL FEMALES	8	1 2				I				G
EXPT	22	1 2	-G -O-I -S-O-I	S I S I	G	<u>G S O I</u> <u>G S O I</u>				<u>G O I</u> <u>G O</u>
EXPT MALES	10	1 2	-S -S-O-I	S O I S I	G	G S O I		-I		G
EXPT FEMALES	12	1 2				S O I O I		S	G S O	<u>G O I</u>

1970 GROUP	N	ART WORK	TTCT (TORRANCE TESTS OF CREATIVE THINKING)							
			ACT 3				TOTALS			
			FLUE	FLEX	ORIG	ELAB	FLUE	FLEX	ORIG	ELAB
ALL SUBJECTS	41	1 2	<u>G S O I</u> <u>G S O I</u>	<u>G S O I</u> <u>G S O I</u>	<u>G O I</u> <u>G O I</u>	<u>G S O I</u> <u>G S O I</u>	G S O	S	<u>G O I</u> <u>G O I</u>	<u>G S O I</u> <u>G S O I</u>
ALL MALES	21	1 2	S S	O G S O	<u>G O I</u> <u>G O I</u>	I G S O I			<u>G O I</u> <u>G O I</u>	I G O I
ALL FEMALES	20	1 2	G S O	G		<u>G O I</u> G S C I	G O			<u>G O I</u> <u>G O I</u>
CONTROL	19	1 2	S			<u>G O I</u> <u>G S O I</u>	S			<u>G O I</u> <u>G O I</u>
CONTROL MALES	11	1 2	S	S	G I G I	I I	S S	S S	G I	<u>G O I</u> <u>G O I</u>
CONTROL FEMALES	8	1 2				<u>G O I</u> <u>G S O I</u>	G			G I
EXPT	22	1 2	<u>G S O I</u> <u>G S O I</u>	<u>G S O I</u> <u>G S O I</u>	<u>G O I</u> <u>G O I</u>	O I G C	O G S O	G S O	<u>G O I</u> <u>G O I</u>	<u>G S O I</u> <u>G S O I</u>
EXPT MALES	10	1 2	G O	O O	O G O	G			O G	I
EXPT FEMALES	12	1 2	S <u>G S O I</u>	S O	O		G S O	S O	O O I	<u>S O I</u> O

Elaboration (in 1967/68 & 1970) and Originality (in 1970) with the Art Works, Gestalt, Originality and Involvement judgements. Some relationship between the TTCT Fluency factor and the Art Works was found in 1970.

More correlations reached the accepted levels of significance between the Art Works and the TTCT in 1970 than in 1967/68. This pattern - i.e. more correlations in the case of 3rd Year subjects than in the case of 1st year subjects - was similar to that noted in the study to test Hypothesis A.

A relationship between the Art Work Spontaneous judgement and the TTCT Fluency and Elaboration was found in 1970, but not in 1967/68 - where only a few correlations were found between the Art Work Spontaneous judgement and the TTCT Originality factor in the case of the Control Group Males.

The table of the correlations for the All Subjects Group (Appendix Table 8a p.123) shows that some negative correlations between the Art Works 1 and 2 Spontaneous judgement and TTCT Act.3. and Total existed in 1967/68, although these did not reach acceptable levels of significance. In 1970 positive correlations between the Art Work Spontaneous judgement and the TTCT Fluency, Flexibility and Elaboration factors were noted (Appendix Table 8b p.123): as were some negative correlations between the Art Works Gestalt, Originality and Involvement and the TTCT Act.2 Fluency and Flexibility. These negative correlations did not appear for the TTCT Totals however. Table 8d (Appendix P.124) shows that the negative correlations in 1970 mainly occurred in the Control Group, where negative correlations were found between Art Works, - Gestalt, Spontaneous, Originality, and Involvement and TTCT Act.2. Fluency, Flexibility and Originality, although positive correlations were found for Elaboration: Table 19:1B (p.262 ) indicates that the Control Males were probably responsible for this.

Appendix Table 8c (Appendix p.124) however, shows that for all the 1970 Males positive correlations were found between the Art Works 1 and 2 and the TTCT Total, except for a negative correlation which was not significant, between the Art Work Involvement judgement and the TTCT Flexibility factor.

This Appendix Table 8c also reveals the strong positive relationship between the Art Works Gestalt, Originality and Involvement judgements and the TTCT Originality and Elaboration factors in the case of the Males. It was noted, as can be seen in Table 19:1B (p.262 ), that in the case of the Females the relationship was only significant for the TTCT Elaboration factor.

Appendix Table 8e (Appendix p.124) shows another example of the positive relationship between the Art Works, Gestalt, Originality and Involvement judgements and the TTCT in 1970: in this case for the Experimental Group with the TTCT Act.3 Fluency, Flexibility, Originality and Elaboration. As can be seen, no significant relationship was found to exist between the Art Work 1 Spontaneous judgement and the TTCT, although all the correlations were positive.

The majority of correlations examined indicate a strong relationship between the Art Work judgements and the TTCT: particularly between the Art Work Gestalt, Originality and Involvement judgements and the TTCT Originality and Elaboration factors.

## 2. Art Works and Personality Test CPQ/HSPQ

In 1967/68 very few correlations were noted that reached accepted levels of significance. There were no significant correlations found for any groups except the Experimental Males, (Table 19:1A p.261 ) In the Experimental Males group (Appendix Table 9b p.125) the pattern of correlations was not consistent. For Art Work 1 Gestalt, Spontaneous, Originality and Involvement the correlations with CPQ Creativity were negative, whereas for Art Work 2 Gestalt, Originality and Involvement the correlations were positive; the correlation with the Art Work 2 Spontaneous judgement still being negative.

For the CPQ Exvia factor the correlations with Art Work 1 Spontaneous and Art Work 2 Gestalt were negative.

Table 19:1B (p.262 ) reveals that in 1970 more correlations were found that reached the accepted levels of significance. These correlations were found for the All Subjects, All Males, Control Males, Experimental Subjects

and Experimental Males groups. No significant correlations were found between the Personality Test and the Females' groups. Appendix Table 9a for the Experimental group (Appendix p.125) is an example of the types of correlations found for the HSPQ Creativity and Exvia factors with the Art Work judgements. Negative correlations were found with the Creativity factor for Art Works 1 and 2 Gestalt, Spontaneous, Originality and Involvement; and positive correlations with the Exvia factor for Art Works 1 and 2 Gestalt, Spontaneous, Originality and Involvement; although not all the correlations reached the accepted levels of significance.

From these results it was considered dubious to draw any conclusions regarding a significant relationship between the Art Work judgements and the Creativity and Exvia factors of the Personality Test; although some negative relationship with the Creativity and positive relationship with Exvia may exist in the case of the Male Subjects.

### 3. Creativity Tests (TTCT) and Personality Tests (CPQ/HSPQ)

The pattern of the relationship between the TTCT and the CPQ/HSPQ was confused. A number of correlations were found, for certain groups, that reached acceptable levels of significance.

Appendix Tables 10a - 10d (Appendix P126) provide examples that illustrate the types of correlations found.

For the Experimental group 1970 (Appendix Table 10a: p.126) the correlations of the TTCT with the HSPQ Creativity factor were negative, except for the TTCT Act.2 Fluency and Originality. The only correlations that reached acceptable levels of significance however, were TTCT Act.1 Elaboration, Act.3. Fluency and Flexibility and Total Fluency and Flexibility.

For the HSPQ Exvia factor the correlations were positive, except for the TTCT Act.2 Flexibility; although the only correlation to reach the  $p \leq .05$  level of significance was TTCT Act.3 Flexibility.

The findings were similar in 1968 for the Experimental Males group (Appendix Table 10b; p.126) where all the CPQ Creativity correlated

negatively with the TTCT except for Act.1. Originality; only TTCT Act.2 Fluency, Flexibility and Originality reached an acceptable level of significance.

For the CPQ Exvia factor the correlations with the TTCT were all positive; and, except for Act.2 Fluency, Flexibility and Originality, all significant.

Appendix Table 10c (Appendix p.126) for the 1970 Control Males and Table 10d for the 1968 Experimental Females reveal the very different correlation pattern found. The TTCT correlations with the CPQ/HSPQ Creativity factor were generally positive; and the correlations with the Exvia factor were generally negative. The positive correlations, except for the TTCT Total Originality in the Experimental Females 1968 and Act.3 Flexibility and Elaboration in the Control Males 1970 group, were not significant. As can be seen in the Tables 10c and 10d, a number of the negative correlations for Creativity and Exvia were significant.

One feature of the correlations found in the Experimental Females group in the 1967/68 was that the TTCT Elaboration factor correlated negatively with Creativity, and positively with Exvia (except in the case of TTCT Act.3), although in view of the non-significance of the majority of these correlations, no conclusions could be drawn.

No clear pattern emerged for the correlation of the Creativity Test with the Personality Test. It was difficult to state that any relationship existed.

#### 4. Intercorrelations: Art Works

The Appendix Tables 11a and 11b (Appendix p.127) for the All Subjects groups 1967/68 and 1970 show the intercorrelations for Art Works 1 and 2 Gestalt, Spontaneous, Originality and Involvement judgements.

Examination of the correlations revealed that the Gestalt, Originality and Involvement judgements were related. In 1967/68 the Spontaneous factor did not correlate significantly with the other three factors. In 1970 the relationship of the Spontaneous factor to the Gestalt, Originality and

Involvement factors was found to reach the accepted levels of significance. Examination of the actual 'r's however, revealed that the relationship between the Spontaneous factor and the three other judgements was weaker than the relationships among the Gestalt, Originality and Involvement judgements.

It was concluded that the Gestalt, Originality and Involvement judgements were strongly related, whereas there was evidence to suggest that the Spontaneous judgement was not strongly related to the three other Art Work judgements. These findings were similar to those found in the study to test Hypothesis A.

#### 5. Intercorrelations: Creativity Test (TTCT)

The Appendix Tables 12a and 12b (Appendix p.128) for the All Subjects groups for 1968 and 1970 show the intercorrelations for the TTCT Acts.1, 2, 3 and Total Fluency, Flexibility, Originality and Elaboration factors.

Examination of the intercorrelations revealed that for the TTCT Totals the four factors correlated significantly in 1968 and in 1970, except for the relationship between Flexibility and Elaboration in 1970.

Inspection of the correlations found significant ( $p \leq .05$  &  $p \leq .01$ ) for the TTCT Acts, 1, 2 and 3 revealed that, although there were relationships among the four factors, it was generally possible to distinguish one from another.

There was a strong relationship between Fluency and Flexibility. The relationship of Fluency and Flexibility with Elaboration was weak, particularly in the case of the TTCT Act.2 1968 and 1970.

The relationship of the Originality factor in Acts 1 and 2 with Originality in Act.3 and Total was weaker in 1970 than in 1968.

The conclusion was drawn that although there was a relationship between the Fluency, Flexibility, Originality and Elaboration factors of the TTCT, the separate factors could be distinguished.

#### Summary of Conclusions concerning the Correlations

- 1) There was a relationship between the Art Work judgements and the Creativity Test, particularly for the Art Work Gestalt, Originality and

Involvement judgements with the TTCT Originality and Elaboration factors. The Originality and Elaboration factors of the TTCT were thus acceptable as predictors of Creativity in the visual art field, as measured by the Art Work judgements.

(ii) A similar pattern of correlations was noted in this study to test Hypothesis B as was noted in the study to test Hypothesis A; i.e. more correlations were found in the case of the 3rd Year groups than were found for the 1st year groups. It was difficult to draw conclusions from these findings. It was possible that the Creativity Tests are not as indicative of creativity in the visual arts in the case of younger children. Extensive longitudinal studies would be necessary to confirm this judgement however.

(iii) It was not possible to draw any firm conclusions about the relationships between the scores on the Art Works and the scores on the Personality Test. A safe conclusion therefore, is that there was no relationship.

iv) There was no certain relationship between the Creativity Test and the Personality Test.

v) There were strong interrelationships among the Gestalt, Originality and Involvement judgements on the Art Works. There was a weak relationship between the Spontaneous Art Work judgement and the three other judgements.

vi) There were relationships among the Fluency, Flexibility, Originality and Elaboration factors of the Creativity Tests (TTCT), although the factors could generally be distinguished from each other.

#### SECTION TWO: INTERJUDGE CORRELATIONS

The results of the Interjudge Correlations for the 1970 Art Work judgements can be seen in Table 19:2 (p.269 ). All the Interjudge correlations were found to be significant at the  $p \leq .005$  level. As note 2 in Table 19:2 indicates, some doubt was felt concerning the correlations for the Gestalt and Spontaneous judgements; however it is probable that correlations of the  $p \leq .005$  level would have been found even if the possible contamination had been avoided.



TABLE 19:2 INTERJUDGE CORRELATIONS: ART WORKS 1970

Interjudge Correlations were performed (Product-moment as for the 1967/68 Correlations: see Appendix Table 1, p. 112) on the data provided by the two Art Judges, for Art Works 1 and 2 for Gestalt, Spontaneous, Originality and Involvement for Form 1 (Control) and Form 2 (Experimental).

These correlations were performed on a computer by R.Grace, who was one of the judges.

Significance levels: (One Tail)  $t = 2.878$   $p \leq .005$  ( $N = 19$ )

$t = 2.831$   $p \leq .005$  ( $N = 22$ )

TABLE OF 'r' FOR THE SCORES OF THE TWO JUDGES ON THE ART WORKS.

FORM 1 (CONTROL)  $N = 19$

GESTALT		SPONTANECUS		ORIGINALITY		INVOLVEMENT	
WORK 1	WORK 2	WORK 1	WORK 2	WORK 1	WORK 2	WORK 1	WORK 2
.9096	.9283	.9629	.9481	.8434	.7917	.7752	.8014
						$t =$	5.0562

FORM 2 (EXPERIMENTAL)  $N = 22$

GESTALT		SPONTANEOUS		ORIGINALITY		INVOLVEMENT	
WORK 1	WORK 2	WORK 1	WORK 2	WORK 1	WORK 2	WORK 1	WORK 2
.9443	.9819	.9328	.9683	.7846	.8205	.8765	.7587
						$t =$	5.2086

't' has only been worked out for the lowest 'r' in each Form. It can be seen that all the Interjudge Correlations are significant ( $p \leq .005$ ).

NOTE 1: The 'One tail' test of significance was applied in this instance as, as a result of the high significant correlations found in the study to test Hypothesis A, only high positive correlations were expected.

NOTE 2: There is some doubt felt concerning the very high correlations found in the Gestalt and Spontaneous Judgements. Due to an error the score sheets given to Judge 2 for the Gestalt and Spontaneous Judgements had already been entered with the scores of Judge 1. Although Judge 2 stated that he did not refer to these, it is possible that some 'halo' effect may have resulted in some contamination. It is unlikely, however, that it has invalidated the reliability of these two judgements in view of the correlations obtained in the earlier study.

The Art Work Judgements were therefore considered to be reliable, although, as was pointed out for the 1967/68 Interjudge correlations, the more subjective nature of the Gestalt Judgement ( $p < .05$  in 1967/68) may have made it less reliable than the judgements for the Spontaneous, Originality and Involvement judgements. Different judges may disagree to a certain extent in their interpretation of the meaning of 'creativity' in the Gestalt judgement.

### SECTION THREE: SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEANS

This section is presented in two parts:

PART A: ANALYSES OF THE DIFFERENCES BETWEEN THE MEANS

PART B: SUMMARY OF THE ANALYSES OF THE DIFFERENCES BETWEEN MEANS

#### PART A: ANALYSES OF THE DIFFERENCE BETWEEN THE MEANS

The analyses of the results of the tests of significance of the differences between means was performed using the following method of examination:

Each of the Main Effects and Interactions that were found to reach acceptable levels of significance were examined in turn in four groups of the twenty-four test items. A different approach was used in the case of the ABCD Overall Interaction.

The Main Effects and Interactions considered to be significant can be seen in the Table for the  $2 \times 2 \times 2 \times 24$  ANOVA (Table 19:3 p.271 ): i.e. Factors B (SEX), AC (GROUP  $\times$  SEX), D (TESTS), BD (SEX  $\times$  TESTS) and ABCD (GROUP  $\times$  SEX  $\times$  YEAR  $\times$  TESTS).

The Test items were divided into four groups as follows:

Group 1: Personality Test (CPQ/HSPQ) Creativity and Exvia

Group 2: Creativity Test (TTCT: all items except for Total Originality and Elaboration)

Group 3: Art Work Judgements (Gestalt and Spontaneous judgements)

Group 4: Tests of Main Interest (TTCT Total Originality and Elaboration; Art Works Originality and Involvement)

Note: A 'fold out page' giving details of the groupings and a Table of Means (Table 19:6) are provided at the end of the Chapter (p.296 ) for ease of identification whilst reading.

TABLE 19:3 ANALYSIS OF VARIANCE 2 x 2 x 2 x 24 (A x B x C x D)

OVERALL ANOVA for GROUP (A) x SEX (B) x YEAR (C) x TESTS (D).

SOURCE	SUM OF SQUARES	df	MEAN SQUARE	F	SIGNIFICANCE
Between S's	17,917.19	40			
A	25.75	1	25.75	-	-
B	2,187.57	1	2,187.57	5.18	$p \leq .05$
AB	198.40	1	198.40	-	-
swg	15,623.31	37	422.25		
Within S's	602,735.10	1927			
C	226.05	1	226.05	2.29	-
AC	653.00	1	653.00	6.61	$p \leq .025$
BC	15.33	1	15.33	-	-
ABC	357.61	1	357.61	3.62	$p \leq .10$
C x swg	3,654.47	37	98.77		
D	494,214.36	23	21,487.58	287.80	$p \leq .001$
AD	955.21	23	41.53	-	-
BD	5,366.41	23	233.32	3.13	$p \leq .001$
ABD	1,282.86	23	55.78	-	-
D x swg	63,536.15	851	74.66		
CD	1,592.08	23	69.22	2.78	$p \leq .001$
ACD	1,279.25	23	55.62	2.23	$p \leq .001$
BCD	743.18	23	32.31	1.30	-
ABCD	1,738.27	23	75.58	3.03	$p \leq .001$
CD x swg	21,219.02	851	24.93		

NOTE 1. The ACD and CD interactions were found to be not significant when tested against the ABCD interaction.  
The ABC interaction ( $p \leq .10$ ) is not considered to be significant.

NOTE 2. The Main Effects and Interactions considered to be significant were:

B - SEX

AC - GROUP x YEAR

D - TESTS

BD - SEX x TESTS

ABCD - GROUP x SEX x YEAR x TESTS

TABLE 19:4 ANALYSIS OF VARIANCE: PRE-TESTS 1967/68, POST-TESTS 1970: TABLES OF 'F'

Tables of 'F' for all 24 sub-test items, and levels of significance.

2 x 2 x 2 Factorial ANOVA for unequal N's. Group (control & experimental) X Sex (male & female) X Year (1967/68 & 1970).

Significance levels for 'F' : 1.35 p ≤ .25 2.79 p ≤ .10 3.98 p ≤ .05 5.29 p ≤ .025  
7.01 p ≤ .01 8.49 p ≤ .005 11.97 p ≤ .001

CODE: A = GROUP, B = SEX, C = YEAR, D = TEST. For each Test (D) Column 1 is 'F' and Column 2 is 'p'.

NAME OF TEST		PERSONALITY TEST CPQ/HSPQ	
FACTORS		CREATIVITY	EXVIA
No. of TEST D		1	2
A GROUP		0.17 -	0.12 -
B SEX		0.99 -	0.28 -
C YEAR		0.94 -	9.77 .005
A GROUP x B SEX		0.44 .250	3.40 .10
A GROUP x C YEAR		1.79 .250	0.00 -
B SEX x C YEAR		2.30 .250	1.18 -
A GROUP x B SEX x C YEAR		1.54 .250	0.63 -

NAME OF TEST		ART WORK 1			
FACTOR		GEST	SPON	ORIG	INVO
No. of TEST		17	18	19	20
A GROUP		0.04 -	0.53 -	2.65 .250	0.24 -
B SEX		11.46 .005	1.62 .250	27.49 .001	26.06 .001
C YEAR		1.90 .250	0.70 -	9.08 .005	2.97 .100
A GROUP x B SEX		0.14 -	5.96 .025	2.65 .250	3.20 .100
A GROUP x C YEAR		3.02 .100	0.13 -	4.33 .05	1.92 .250
B SEX x C YEAR		0.20 -	1.64 .250	0.65 -	0.23 -
A GROUP x B SEX x C YEAR		0.00 -	6.19 .025	0.00 -	0.02 -

NAME OF TEST		ART WORK 2			
FACTOR		GEST	SPON	ORIG	INVO
No. OF TEST		21	22	23	24
A GROUP		0.62 -	0.00 -	0.75 -	0.32 -
B SEX		15.21 .001	1.24 -	11.62 .005	21.81 .001
C YEAR		0.00 -	1.67 .250	2.03 .250	0.81 -
A GROUP x B SEX		2.41 .250	0.00 -	1.99 .250	1.92 .250
A GROUP x C YEAR		0.35 -	1.36 .250	1.87 .250	1.09 -
B SEX x C YEAR		1.22 -	0.45 -	1.14 -	0.22 -
A GROUP x B SEX x C YEAR		0.18 -	0.97 -	0.49 -	0.11 -

## NAME OF TEST: (TTCT) TORRANCE TESTS OF CREATIVE THINKING ACT 1

FACTOR	ORIG		ELAB	
No of TEST D	3		4	
A GROUP	0.02	-	0.00	-
B SEX	2.16	.250	0.53	-
C YEAR	4.78	.05	0.40	-
A GROUP x B SEX	0.09	-	0.04	-
A GROUP x C YEAR	3.67	.100	1.89	.250
B SEX x C YEAR	1.12	-	2.10	.250
A GROUP x B SEX x C YEAR	0.09	-	0.60	-

## NAME OF TEST (TTCT) TORRANCE TESTS OF CREATIVE THINKING: ACT 2

FACTOR	FLUE		FLEX		ORIG		ELAB	
No. OF TEST D	5		6		7		8	
A GROUP	0.06	-	0.08	-	0.00	-	0.25	-
B SEX	0.01	-	0.00	-	2.21	.250	4.88	.05
C YEAR	0.54	-	0.01	-	2.47	.250	1.57	.250
A GROUP x B SEX	0.38	-	1.26	-	0.00	-	0.99	-
A GROUP x C YEAR	1.54	.250	2.06	.250	4.03	.05	0.69	-
B SEX x C YEAR	4.81	.05	4.00	.05	2.84	.100	0.05	-
A GROUP x B SEX x C YEAR	0.93	-	0.77	-	0.38	-	2.33	.250

## NAME OF TEST (TTCT) TORRANCE TESTS OF CREATIVE THINKING: ACT 3

FACTOR	FLUE		FLEX		ORIG		ELAB	
No of TEST D	9		10		11		12	
A GROUP	2.15	.250	1.36	.250	0.23	-	3.23	.100
B SEX	8.32	.01	2.74	.250	2.03	.250	13.67	.001
C YEAR	2.20	.250	5.47	.025	0.00	-	0.05	-
A GROUP x B SEX	0.41	-	0.09	-	0.07	-	3.39	.100
A GROUP x C YEAR	0.95	-	0.81	-	1.92	.250	0.43	-
B SEX x C YEAR	0.52	-	0.59	-	0.01	-	0.20	-
A GROUP x B SEX x C YEAR	0.51	-	0.81	-	0.68	-	1.05	-

## NAME OF TEST (TTCT) TORRANCE TESTS OF CREATIVE THINKING: TOTALS

FACTOR	FLUE		FLEX		ORIG		ELAB	
No OF TEST D	13		14		15		16	
A GROUP	1.28	-	0.86	-	0.12	-	0.72	-
B SEX	4.02	.05	1.23	-	0.96	-	6.53	.025
C YEAR	1.93	.250	2.69	.250	0.02	-	0.68	-
A GROUP x B SEX	0.54	-	0.58	-	0.02	-	0.92	-
A GROUP x C YEAR	1.52	.250	1.75	.250	5.13	.05	1.07	-
B SEX x C YEAR	1.98	.250	2.08	.250	0.84	-	0.08	-
A GROUP x B SEX x C YEAR	0.79	-	1.03	-	0.69	-	1.86	.250

TABLE 19:5 FURTHER STATISTICAL ANALYSIS ON SELECTED TESTS

Where the results of the 2 x 2 x 2 x 24 ANOVA and the 2 x 2 x 2 ANOVA indicated that further investigation would be useful, one way ANOVA's, a 't' Test and Non-Parametric Tests were performed. Tests on the Originality and Elaboration factors of the TTCT and the Originality factor of the ART WORKS were involved here. Results only are given in this table.

ONE-WAY ANOVA (Analysis of Variance)

TEST No.	TEST AND FACTOR	GROUP AND YEAR	p ≤
7	TTCT ACT 2 ORIGINALITY	Experimental Males 1968 - 1970	.05
7	" " 2 "	All Experimental 1968 - 1970	.01
15	" TOTAL "	Control - Experimental 1970	.05
16	" " ELABORATION	All Experimental 1968 - 1970	.025
19	ART WORK 1 ORIGINALITY	All Experimental 1967 - 1970	.001
19	" " 1 "	Experimental Males 1967 - 1970	.05
19	" " 1 "	Experimental Fems. 1967 - 1970	.005
23	" " 2 "	All Experimental 1967 - 1970	.05
23	" " 2 "	Experimental Fems. 1967 - 1970	.025*

\* F obtained is nearer p ≤ .01 than to p ≤ .025

't' TEST

TEST No.	TEST AND FACTOR	GROUP AND YEAR	p ≤
19	ART WORK 1 ORIGINALITY	All Experimental 1967 - 1970	.005

NON-PARAMETRIC TESTS

The Non-Parametric Tests were used as a 'check' on other statistical methods, particularly in the case of Test 19 - where an F MAX test for homogeneity was found to have a significance level of p ≤ .05.

MANN-WHITNEY U TEST (MW) and WILCOXON SIGNED-RANKS TEST (WS)

TEST No.	TEST AND FACTOR	GROUP AND YEAR	p ≤
19	ART WORK 1 ORIGINALITY	Control-- Experimental 1967	.05 <u>MW</u>
19	" " 1 "	" - " 1970	n/s "
19	" " 1 "	All Experimental 1967 - 1970	.005 <u>WS</u>
15	TTCT TOTAL ORIGINALITY	All Experimental 1968 - 1970	.025
23	ART WORK 2 ORIGINALITY	All Experimental 1967 - 1970	.01

Differences between means that were found to be significant in the subsidiary analysis were considered with the relevant Main Effects and Interactions. These subsidiary analyses included the 2 x 2 x 2 ANOVAs (Table 19:4 pp 272 - 273), One-way ANOVAs, 't' Test, and Non-Parametric Tests (Table 19:5 p. 274).

The final section of the examination of the results is concerned with those factors where the differences between the means, for certain test items, reached an acceptable level of significance in the subsidiary analyses but did not do so in the Overall 2 x 2 x 2 x 24 ANOVA.

For ease of interpretation Graphs showing Main Effects and Interactions are included in the Appendix (Appendix Part Five:pp. 129-149 and Appendix Part Six: in Pocket at back of Appendix). The graphs for the different tests (D), examined under a particular Main Effect or Interaction, are drawn with equal axes so that comparisons can be made within that particular set of graphs. The levels of significance of differences between the means and means themselves are shown on the relevant graph. These graphs are referred to in the text where necessary.

The analyses of the results that follow are considered under the following headings:

FACTOR B: SEX

INTERACTION AC: GROUP x YEAR

FACTOR D: TESTS

INTERACTION BD: SEX x TESTS

OVERALL INTERACTION ABCD: GROUP x SEX x YEAR x TESTS

OTHER FACTORS AND INTERACTIONS

FACTOR B: SEX ( $p \leq .05$ )

The Overall ANOVA (Table 19:3 p.271) revealed that the difference between the means for Factor B (Sex) was significant.

Examination of the means shown in the graph of the main effect B (Appendix p.130) showed that the Females scored higher than the Males. The 2 x 2 x 2 ANOVAs for individual Tests (Table 19:4 pp.272 & 273) revealed

the differences between the means for the four groups as follows:

Note: Where the level of the significance between the means was  $P > .25$  the individual tests are not listed.

Group 1: CPQ/HSPQ

The differences between the means for the Creativity and Exvia factors were not significant. There was no difference between Males and Females for these Personality Test factors.

Group 2: TTCT

The  $2 \times 2 \times 2$  ANOVA's revealed that the differences between the means reached acceptable levels of significance in the case of the following Tests:

TEST: D No.	$p \leq$	APPENDIX GRAPHS: SET ONE
D 3 Act.1.Originality	.250	page 130
D 7 Act.2 Originality	.250	" 130
D 8 Act.2 Elaboration	.05	" 130
D 9 Act.3 Fluency	.01	" 131
D 10 Act.3 Flexibility	.250	" 131
D 11 Act.3 Originality	.250	" 131
D 12 Act.3 Elaboration	.001	" 131
D 13 Total Fluency	.05	" 132

Examination of the Graphs showed that the Females scored higher than the Males, except for Test D 7 where the Males scored higher than the Females.

Group 3: Art Works

Females scored higher than Males in the following Tests:

TEST: D No.	$p \leq$	APPENDIX GRAPHS: SET ONE
D 17 Art Work 1 Originality	.005	page 132
D 18 " 1 Spontaneous	.25	" 132
D 21 " 2 Gestalt	.001	" 133

The graphs reveal the differences between the Males and Females.



#### Group 4: Tests of Main Interest

Females scored higher than Males in the following Tests:

TEST: D NO.	p $\leq$	APPENDIX GRAPHS: SET ONE
D 16 TTCT Total Elaboration	.025	page 132
D 19 Art Work 1 Originality	.001	" 133
D 20 " " 1 Involvement	.001	" 133
D 23 " " 2 Originality	.005	" 133
D 24 " " 2 Involvement	.005	" 134

The difference between the means for Males and Females for Test D15 (TTCT Total Originality) was not significant.

The 2 x 2 x 2 ANOVA for D19 revealed that, as can be seen in Table 19:4 (p. 272), the differences between the means for the Main Effect C (Year) and the Interaction AC (Group x Year) reached acceptable levels of significance. It was therefore considered advisable to perform further analyses (1 x 1 ANOVAs) on Test D19, on the B (Sex) factor, for Control and Experimental groups, Males and Females.

A similar Main Effect and Interaction were noted for Test D.23, but the significance of the differences between the means only reached the p  $\leq$  .25 level. Further analyses were performed however for D 23.

The results of the subsidiary analyses for Tests D19 and D23 can be seen in Table 19:5 (p.274 ).

#### TEST D19

The Experimental Males increased their scores from 1967/68 to 1970 (p  $\leq$  .05). The Experimental Females also increased their scores from 1967/68 to 1970 )p  $\leq$  .005)

As there was little difference between the means for the Control Group Males and Females for 1967/68 to 1970, further analyses were not performed for the Control group on the B (Sex) factor. It was noted that in 1970 the Control group Females did score higher than the Males in the Control and Experimental groups, and higher than the Females in the Experimental group in 1967/68 and 1970 (see Table of Means Table 19:6 p. 296 ).

### TEST D23

The difference between the means was only found to be significant ( $p \leq .025$ ) in the case of the Experimental Females, who increased their scoring from 1967/68 to 1970.

These individual analyses for Tests D19 and D23 confirmed that the main effect was that Females scored higher than Males. Examination of the means (Table 19:6 p. 296) however, indicate that in certain tests - e.g. Tests D8, 12, 13 and 16 - the Control group Females scored lower in 1970 than in 1967/68. Inspection of the means for Test D9 (Table 19:6 p. 296) show that all groups obtain lower scores in 1970 than in 1967/68, but the difference between the means for the Control Females was the greatest.

From the above analyses on Factor B (Sex) it was concluded that, in general, Females scored higher than Males. They were more creative than Males, as measured by the Art Work judgements for Gestalt, Originality and Involvement. Females appeared to be more Fluent and Elaborative, as measured by the TTCT, but there were not sufficient grounds for stating that they were more Original or Flexible than Males. There was no difference between Males and Females for the Creativity and Exvia factors of the Personality Test.

### INTERACTION AC: GROUP x YEAR ( $p \leq .025$ )

The Overall ANOVA (Table 19:3 p. 271) revealed that the difference between the means for the AC (Group x Year) interaction was significant. The graph of the AC interaction (Appendix p.135), for the Overall Effect, showed that the scores of the Experimental group (A2) had increased from 1967/68 (C1: Year 1) to 1970 (C2: Year 2), whereas the scores of the Control group (A1) decreased from Year 1 to Year 2.

The  $2 \times 2 \times 2$  ANOVA's (Table 19:4 p. 272) revealed the following differences between the means for the four groups of Tests.

#### Group 1: CPQ/HSPQ

The difference between the means for the AC Interaction for the Creativity factor (Test D1) was found to be significant at the  $p \leq .25$  level

The graph for D1 (Appendix Graphs: Set Two p.136) revealed that the scores of the Control group (A1) had increased from Year 1 to Year 2, whereas the scores of the Experimental group had decreased.

The AC Interaction for the Exvia factor was not significant.

Group 2: TTCT

The 2 x 2 x 2 ANOVA's (Table 19:4 p. 272 ) revealed that the differences between the means for the AC Interaction reached levels of significance for the Tests D as follows:

TEST: D No.	p $\leq$	APPENDIX GRAPHS: SET TWO
D 3 Act.1 Originality	.10	page 136
D 4 " 1 Elaboration	.250	" 136
D 5 " 2 Fluency	.250	" 137
D 6 " 2 Flexibility	.250	" 137
D 7 " 2 Originality	.05	" 137
D 11 " 3 Originality	.250	" 138
D 13 Total Fluency	.250	" 139
D 14 " Flexibility	.250	" 139

Inspection of the graphs for the above Tests showed that for Tests D4-7 & 11 the scores of the Experimental group had increased from Year 1 to Year 2, whereas the scores of the Control group had decreased. For Tests D3, D13, and D14 the scores for the Control group had decreased considerably from Year 1 to Year 2, whereas the scores for the Experimental group were similar in Year 1 and Year 2, or had decreased very slightly.

Examination of the graphs for the AC Interaction, where the differences between the means did not reach acceptable levels of significance, showed similar interactions; i.e. either:

- a) Scores for the Experimental group lower than Control in Year 1 but higher than Control in Year 2.

- b) Both Experimental and Control groups decreased in scoring from Year 1 to Year 2, but the Control group's scores decreased by a greater amount.
- c) The Experimental group increased its scores from Year 1 to Year 2, whereas the Control group scores decreased from Year 1 to Year 2.

One-Way ANOVA's were performed on the data for Test D7 ( $p \leq .05$  in the  $2 \times 2 \times 2$  ANOVA) to ascertain if the differences between the means for the Experimental group from Year 1 to Year 2 were significant. Table 19:5

(p. 274 ) reveals the following results were found significant for Test D7:

Experimental group - Year 1 to Year 2 -  $p \leq .01$

Experimental Males - " " -  $p \leq .05$

Inspection of the means (Table 19:6 p.296 ) showed that Experimental group males and females increased their scores from Year 1 to Year 2 but the Males increased their scores by a greater amount.

### Group 3: Art Works

The  $2 \times 2 \times 2$  ANOVA's (Table 19:4 p.272 ) revealed that the differences between the means were significant for the following Tests:

TESTS: D No.	$p \leq$	APPENDIX GRAPHS: SET TWO
D 17 Art Work 1 Gestalt	.10	Page 140
D 22 " 2	.25	" 141

The graph shows that for Test D17 the scores for the Experimental group increased from Year 1 to Year 2, whereas the scores for the Control group decreased. For Tests D22 the graph revealed that the scores for both the Experimental and Control groups increased from Year 1 to Year 2, but the scores for the Control group increased by a greater amount.

Examination of the graphs for Tests D18 and D21 (Appendix pp.140 & 141), where the differences between the means were not significant, show that the Experimental group increased its scores from Year 1 to Year 2, whereas the scores for the Control group either increase slightly (D18) or decrease (D21) from Year 1 to Year 2.

#### Group 4: Tests of Main Interest

The 2 x 2 x 2 ANOVA's (Table 19:4 p. 272) revealed that the differences between the means were significant for the following Tests:

TESTS: D No.	$p \leq$	APPENDIX GRAPHS: SET TWO
D 15 TTCT TOTAL Originality	.05	page 139
D 19 Art Work 1 Originality	.05	" 140
D 20 " 1 Involvement	.250	" 140
D 23 " 2 Originality	.250	" 141

The graphs reveal that for each of these tests the scores for the Experimental group increase appreciably from Year 1 to Year 2, whereas the scores for the Control group either decrease or increase very slightly.

The graphs of the other Tests included this group (Tests D16 and D24: pp.139 & 141), although the differences between the means were not significant, show a similar pattern.

One-Way ANOVA's (Table 19:5 p. 274) were performed for Tests D15, D16, D19 and D23 to clarify the Interaction AC still further.

In the case of D15 the One-Way ANOVA confirmed that the difference between the means of the Experimental and Control groups in 1970 was significant at the  $p \leq .05$  level; the Experimental group scoring the higher. A Non-Parametric test (Table 19:5 p. 274) showed that the Experimental group had increased its scoring from Year 1 to Year 2 by a significant amount ( $p \leq .025$ ). The graph for D15 shows that the Control group's scoring had decreased appreciably. This Test D15 (TTCT Total Originality) was one of the crucial tests concerned in the study to test Hypothesis E.

In the case of Test D16 (difference between the means was not significant in the 2 x 2 x 2 ANOVA for the AC Interaction) it was found that the Experimental group increased its scoring from Year 1 to Year 2. ( $p \leq .025$ ).

For Tests D19 and D23 the subsidiary analyses (One-way ANOVA's, 't' Test, and Non-Parametric Tests) indicated that the Experimental group had increased its scores from Year 1 to Year 2 by a significant amount, particularly so in the case of the Experimental Females. It was further noted

in the case of Test D19 that the difference between the means of the Control and Experimental groups in Year 1 was significant ( $p \leq .05$ ) - the means for the Control group being higher, whereas in Year 2 there was no significant difference found; although the means for the Experimental group were, in this case, higher than those of the Control group.

In view of the fact that the differences between the means for the ABC (Group x Sex x Year) Interaction were found to be significant in the Overall  $2 \times 2 \times 2 \times 24$  ANOVA (Table 19:3 p. 271 ) at the  $p \leq .10$  level, it was decided to examine this interaction at this point to ascertain if the ABC Interaction had any effect on the AC Interaction.

The  $2 \times 2 \times 2 \times 24$  ANOVA's (Table 19:4 p. 272 ) revealed that only in the case of the four tests tabled below was the difference of the means for the ABC Interaction significant at acceptable levels:

TEST D No.	$p \leq$	APPENDIX GRAPHS SET THREE
D 1 CPQ/HSPQ Creativity	.250	-
D 8 TTCT Act.2 Elaboration	.250	-
D 16 TTCT Total Elaboration	.250	-
D 18 Art Work 1 Spontaneous	.025	pages 142 - 144

Only in the case of test D18 did the level of significance for the differences between the means indicate that the ABC Interaction may have had some effect on the AC Interaction (also significant at the  $p \leq .025$  level. Graphs were drawn for the ABC Interaction to examine any possible effect (Appendix Graphs: Set Three p.142 - 144).

It was noted from the graphs that the Experimental group increased its scores from Year 1 to Year 2. This was mainly due to the increase in scoring for the Experimental Males, as the Experimental Females achieved similar scores in Year 1 and Year 2. The increase in scoring for the Control Females was cancelled, to a large extent, by the decrease in scoring for the Control Males.

Overall it was noted that Experimental Females scored higher than Control Males; and Control Females scored higher than Experimental Females.

In Year 1 this effect was hardly noticeable, whereas in Year 2 it was markedly noticeable.

It was also noted that when the scores for both Control and Experimental groups were considered together the Males and Females were similar in Year 1 whereas the Females scored higher than the Males in Year 2. For the Control group the scores for the Males decreased from Year 1 to Year 2 and the scores for the Females increased. For the Experimental group both Males and Females increased their scores from Year 1 to Year 2; the Males more than the Females.

From the analyses concerned with Test D18 above it was considered that the ABC Interaction did not substantially influence the AC Interaction.

From all the analyses of the AC Interaction it was concluded that the general effect was that the Experimental group markedly increased its scores from Year 1 to Year 2, whereas the Control group achieved similar scores, increased slightly, or decreased its scores from Year 1 to Year 2. This general effect was particularly noted for the TTCT Total Originality and Art Work 1 Originality.

FACTOR D: TESTS ) $p \leq .001$

The Overall ANOVA (Table 19:3 p. 271 ) revealed that the differences between the means for the twenty-four Tests (D) were significant. The graph (Appendix Graphs: Set Four p.145) illustrates these differences.

The differences were expected and inevitable due to the variety of different types of test items and methods of scoring.

INTERACTION BD: SEX x TESTS ( $p \leq .005$ )

The Overall ANOVA (Table 19:3 p. 271 ) indicated that the difference between the means for the BD Interaction was significant. The graph (Appendix Graphs: Set Five p.146) showed that in nineteen of the twenty-four tests the Females scored higher than the Males. The Males scored higher than the Females in Tests D1, D2 and D7. The Males achieved similar scores to the Females in Tests D5 and D6.

The 2 x 2 x 2 ANOVA's showed that in the cases of eleven tests the differences between the means for the Males and Females were significant

(Note: the eleven tests were those discussed under the Factor B analysis).

The overall effect of the BD interaction was that Females score higher than Males in the majority of the Tests.

OVERALL INTERACTION ABCD GROUP x SEX x YEAR x TESTS (p  $\leq$  .001)

Table 19:3 (p. 271 ) shows the significance level reached for the ABCD Interaction in the  $2 \times 2 \times 2 \times 24$  ANOVA. Although the findings for the Main Effects and Interaction already considered reveal factors relevant to the ABCD Interaction it was decided to examine this interaction by inspecting 'changes in the direction of scoring' for A, B and C for each of the twenty-four Tests D.

The method for examining the 'changes' involved two approaches:

- A) By constructing a 'Table of Direction of changes in Scoring' (without regard to the amount of change) and examining the table for patterns of change that repeated.
- B) By comparing graphs for the Overall Interaction for Factors A (Group), B (Sex) and C (Year) for D (twenty-four Tests). The graphs being prepared as transparencies for ease of comparison.

The analyses that follow are discussed in the two sections:

A Analyses of Directions of Change

B Analyses of Graph Comparisons

A Analyses of Direction of Change

Examination of the Table of Direction of Changes in Scoring (Table 19:7 p. 285 ) revealed the direction of changes from Year 1 to Year 2 for the 48 test comparisons (i.e. 24 Male: 24 Female) in three areas:

1. Changes concerning the Control and Experimental Groups.
2. Changes concerning Group and Sex.
3. Patterns of Change concerning Tests.
1. Changes concerning the Control and Experimental groups.

The following changes in the direction of scoring from Year 1 to Year 2 for the Control and Experimental groups - irrespective of sex - were noted among the 48 comparisons:



TABLE 19:7 TABLE OF DIRECTION OF CHANGES IN SCORING

Comparisons of GROUP, SEX, and YEAR for each of the 24 TESTS.

KEY: M = MALE, F = FEMALE, C = CONTROL, E = EXPERIMENTAL, D = TEST

The numbers on the right hand side refer to the number of patterns of change found to be similar: e.g. the number 7 indicates the seven tests that have the same pattern of change. X = No similar pattern found.

NOTE: For identification of a TEST No. see the 'fold out page'.

TEST D No.	SEX	YEAR 1 1967/68		YEAR 2 1970		REPEAT PATTERNS						
						a	b	c	d	e	f	g
1	M F	C higher than E E " " C		C higher than E C " " E								X
2	M F	E " " C C " " E		E " " C C " " E				2				
3	M F	C " " E C " " E		E " " C E " " C		7						
4	M F	C " " E C " " E		E " " C E " " C		7						
5	M F	C " " E C " " E		C " " E E " " C							2	
6	M F	C " " E C " " E		C " " E E " " C							2	
7	M F	C " " E C " " E		E " " C E " " C		7						
8	M F	E " " C C " " E		C " " E E " " C			2					
9	M F	E " " C E " " C		E " " C E " " C								X
10	M F	E " " C C " " E		E " " C E " " C					2			
11	M F	C " " E C " " E		E " " C E " " C		7						
12	M F	E " " C C " " E		C " " E C " " E								X
13	M F	E " " C C " " E		E " " C E " " C					2			
14	M F	C " " E C " " E		E " " C E " " C		7						
15	M F	C " " E C " " E		E " " C E " " C		7						
16	M F	E " " C C " " E		C " " E E " " C			2					
17	M F	C " " E C " " E		E " " C E " " C		7						
18	M F	E " " C E " " C		E " " C C " " E								X
19	M F	C " " E C " " E		E " " C C " " E			4					
20	M F	C " " E C " " E		E " " C C " " E			4					
21	M F	E " " C C " " E		E " " C C " " E					2			
22	M F	E " " C E " " C		C " " E C " " E								X
23	M F	C " " E C " " E		E " " C C " " E			4					
24	M F	C " " E C " " E		E " " C C " " E			4					

- a) The Experimental Subjects moved from the lower scoring position to the higher scoring position in twenty-four cases. See Table 19:7 (p. 285 ) for Tests D3 - D8, D10, D11, D13 - D17, D19, D20, D23 and D24.
- b) There was no change in direction in seventeen cases.
- c) The Control Subjects moved from the lower scoring position to the higher scoring position in seven cases.

## 2. Changes concerning Group and Sex

The following changes in the direction of scoring from Year 1 to Year 2 for Males and Females were noted.

In Year 1 the scores for the Control Males were higher than the Experimental Males in 14 cases.

In Year 2 the scores for the Control Males were higher than the Experimental Males in 7 cases.

In Year 1 the scores for the Control Females were higher than the Experimental Females in 20 cases.

In Year 2 the scores for the Control Females were higher than the Experimental Females in 10 cases.

Thus in Year 1 the scores for the Control group were higher than those of the Experimental group in 34 cases out of 48 comparisons; whereas in Year 2 the scores for the Experimental group were higher than those for the Control group in 31 cases out of 48.

Although these comparisons did not take into account the amount of change in the scoring, it appeared that the Experimental group had improved from Year 1 to Year 2, whereas the Control group had deteriorated.

## 3. Patterns of Change concerning Tests

Examination of the changes in direction of scoring for the twenty-four Tests (D) revealed that particular patterns occurred more than once in six cases (see REPEAT PATTERNS column in Table 19:7p. 285). These are considered under the letters used as column headings in the Table of Direction of Changes in Scoring.

- a) The seven Tests (D) listed in column a were found to share the following pattern of changes in scoring:

In Year 1: Controls higher than Experimental (Males and Females)

In Year 2: Experimental higher than Controls (Males and Females)

The Tests were:

D3 & D4 - TTCT Act.1 Originality and Elaboration

D7 - TTCT Act.2 Originality

D11 - TTCT Act.3 Originality

D14 & D15 TTCT Total Flexibility and Originality

D17 Art Work 1 Gestalt

b) The four Tests (D) listed in column b were found to share the following pattern of changes in scoring:

In Year 1: Controls higher than Experimental (Males and Females)

In Year 2: Experimental Males higher than Control Males

" 2: Control Females higher than Experimental Females

The Tests were:

D19 & D20 Art Work 1 Originality and Involvement.

D23 & D24 " 2 Originality and Involvement

Four other patterns of change in scoring were found to occur twice:

c) The two Tests (D) listed in column c were found to share the following pattern of change in scoring:

Experimental Males higher in Year 1 but lower in Year 2.

Control Females higher in Year 1, but lower in Year 2.

The Tests were:

D8 TTCT Act.2 Elaboration

D16 TTCT Total Elaboration

d) The two Tests listed in column d shared the following pattern of change in scoring:

Experimental Males higher than Control Males in Years 1 and 2

Control Females higher than Experimental Males in Years 1 and 2

The Tests were:

D2 CPQ/HSPQ Exvia

D21 Art Work 2 Gestalt

e) The two Tests listed in column e shared the following pattern of change in scoring:

Experimental Males higher than Control Males in Years 1 and 2 Control Females higher than Experimental Females in Year 1

Experimental Females higher than Control Females in Year 2

The Tests were:

D10 TTCT Act.3. Flexibility

D13 " Total Fluency

f) The two Tests listed in column f shared the following pattern of change in scoring:

Control Males higher than Experimental Males in Years 1 and 2

Control Females higher than Experimental Females in Year 1

Experimental Females higher than Control Females in Year 2

The Tests were:

D6 and D7 TTCT Act.2 Fluency and Flexibility

The remaining five patterns listed under column X, i.e. Tests D1, D9, D12, D18 and D22, had nothing in common with each other nor with any of the other patterns.

The repeating pattern found in the case of the seven Tests listed in a above is interesting in that the 'Originality' scores for the TTCT Acts 1, 2, 3 and Total were involved. The repeats of the pattern for b above i.e. Art Works Originality and Involvement, is similarly interesting. These eleven tests included five of the 'Tests of Main Interest' from Group 4 (see 'fold out Page').

#### B Analyses of Graph Comparisons

The twelve transparent graphs (Appendix Part Six: Graphs 9:A to 9:L ABCD OVERALL INTERACTION: in Back Pocket of Appendix) were compared to find obvious visible differences among the factors A (Group), B (Sex) and C (Year) for D (Tests), that may have accounted for level of the significance of the

differences between the means ( $p \leq .001$ ) for the Overall Interaction ABCD.

The Tests (D) were considered together, and the number only of differences for Group, Sex, and Year were noted without consideration of which Tests were involved in the differences found.

From the examination of the graphs the following differences for Group, Sex and Year were found:

#### MALES

Year 1 Controls were: Similar to Controls Year 2  
Similar to Experimental Year 1  
Lower than Experimental Year 2

Year 2 Controls were: Slightly lower than Experimental Year 1  
Lower than Experimental Year 2

Year 1 Experimental were: Lower than Experimental Year 2

#### FEMALES

Year 1 Controls were: Higher than Controls Year 2  
Much higher than Experimental Year 1  
Similar to Experimental Year 2

Year 2 Controls were: Slightly higher than Experimental Year 1  
Lower than Experimental Year 2

Year 1 Experimental were: Lower than Experimental Year 2

#### MALES AND FEMALES COMPARED

Females: Year 1 Control were: Much higher than Control Males Year 1  
" " " " Year 2  
" " Experimental " Year 1  
" " " " Year 2

Females: Year 2 Control were:  
Slightly higher than Control Males Year 1  
Higher than Control Males Year 2  
Higher than Experimental Males Year 1  
Similar to (very slightly higher) to Experimental Males Year 2

Females: Year 1 Experimental were: Higher than Control Males Year 1  
" " " " Year 2  
" " Experimental " Year 1  
Similar to " " Year 2

Females: Year 2 Experimental were:  
Much higher than Control Males Year 1  
" " " " Year 2  
" " "Experimental " Year 1  
" " " " Year 2

NOTE: These differences were noted without reference to which Tests were involved.

Although no comprehensive analyses of the differences in individual Tests were undertaken, among the Tests where differences were often noticed

were the following:

TESTS No's D4, D7, D8, D11, D12, D15, D16, D17, D19, D20 and D23

As can be seen from the 'Fold out Page' (P. 296) these tests were mainly concerned with Originality and Elaboration where the TTCT was involved. These tests were particularly noticed for the Experimental group Females, where the scoring increased from Year 1 to Year 2.

From the above analyses the following general interpretation was formed.

- 1) The Males in the Experimental and Control groups are similar in Year 1. The Control group Males are similar in Year 1 and Year 2; whereas the Experimental males have improved from Year 1 to Year 2.
- 2) The Control Females score much higher than the Experimental Females in Year 1, but their scores are similar in Year 2. The Experimental Females have improved from Year 1 to Year 2; whereas the Control females have either deteriorated or remained the same.
- 3) Females score higher than Males; although in Year 2 the scores for the Control Females are nearer to those of the Males. In Year 2 the Experimental Females score much higher than the Males.

The main conclusions reached for the ABCD Overall Interaction were:

- a) The Experimental Group has improved from Year 1 to Year 2
- b) The main factor involved in this improvement is the Originality factor in the TTCT and Art Work Judgements - both included in Group 4: Tests of Main Interest.
- c) Females score higher than Males.

#### OTHER FACTORS AND INTERACTIONS

The differences between the means for the following Factors and Interactions were found to be significant in the  $2 \times 2 \times 2$  ANOVA's where they were not found to be significant in the  $2 \times 2 \times 2 \times 24$  Overall ANOVA (Table 19:3 p. 271 ).

#### FACTOR C: YEAR

The differences between the means were found to be significant in the  $2 \times 2 \times 2$  ANOVA's (Table 19:4 p. 272) for the following Tests:

TEST: D No.	p	APPENDIX GRAPHS: SET SIX
D 2 CPQ/HSPQ Exvia	.005	page 147
D 3 TTCT Act.1 Originality	.05	" 147
D 10 " Act.3 Flexibility	.025	" 147
D 19 Art Work 1 Originality	.005	" 147

For Test D2 the graph revealed that the subjects scored higher in Year 2 than in Year 1. Inspection of the means (Table 19:6 p.296) showed that the Sex or Group factors do not play an important part in this effect, although there was an increase in scoring in the case of the Female subjects.

For Test D3 the graph revealed that there was a general decrease in scoring from Year 1 to Year 2. Inspection of the means however, showed that the Experimental Males increased their scoring from Year 1 to Year 2.

For Test D10 the graph showed a decrease in scores from Year 1 to Year 2. Examination of the means revealed that the scores for the Control Females decreased from the highest position in Year 1 to the lowest position in Year 2.

For Test D19 the graph reveals an increase in scoring from Year 1 to Year 2. Inspection of the means showed that the increase in scoring was greater in the case of the Experimental group than in the case of the Control group.

These findings tend to amplify observations made in other analyses.

#### INTERACTION BC: GROUP x SEX

The differences between the means were found to be significant in the 2 x 2 x 2 ANOVA's (Table 19:4 p. 272) for the following Tests:

TEST: D No.	p	APPENDIX GRAPHS: SET SEVEN
D 5 TTCT Act.2. Fluency	.05	page 148
D 6 " " 2. Flexibility	.05	" 148

For Test D 5 the graph revealed that in Year 1 the Females scored higher than the Males; whereas in Year 2 the position was reversed. Inspection of the means (Table 19:6 p. 296 ) showed that this was true of both Control and Experimental groups.

For Test D 6 inspection of the graph and the means revealed a similar effect; although in this case the Experimental Females increased their scoring very slightly from Year 1 to Year 2.

#### INTERACTION AB: GROUP x SEX

The differences between the means for the AB interaction were found to be significant in the 2 x 2 x 2 ANOVA's (Table 19:4 p. 272 ) in the case of one Test only:

Test D18 Art Work 1 Spontaneous  $p \leq .025$  Appendix Graphs: Set Eight p.149

The graph revealed that in the Control group the Females scored higher than the Males, whereas for the Experimental group the reverse was found; although the difference between the Males and Females was not as great as in the case of the Control group.

#### INTERACTION ABC: GROUP x SEX x YEAR

This interaction, found significant at the  $p \leq .025$  level, for Test D18 only was discussed under the AC INTERACTION (p. 282 )

#### PART B: SUMMARY OF THE ANALYSES OF THE DIFFERENCES BETWEEN MEANS

The summary of the analyses of the differences between the means is considered under two headings:

- i) Factors found significant in Subsidiary Analyses
- ii) Factors found significant in Main Analyses
- i) Factors found significant in Subsidiary Analyses

FOR the 2 x 2 x 2 x 24 Overall ANOVA the differences between the means were found to be not significant in the following Main Effects and Interactions (Table 19:3 p. 271).

Group, Group x Sex, Year, Year x Sex, Group x Sex x Year, Group x Tests, Group x Sex x Tests, and Sex x Year x Tests.

The subsidiary 2 x 2 x 2 ANOVA's revealed that for certain Tests the differences between the means were significant for some of the above Main Effects and Interactions:

For the Year Effect there was an increase in scoring from 1967/68 to 1970 for the Personality Test Extraversion factor and for the Art Work 1 Originality factor; although for the latter factor the increase in scoring was



greater for the Experimental group than for the Control Group.

There was a decrease in scoring from 1967/68 to 1970 for the Creativity Test (TTCT) Activity 1 Originality factor; although the Experimental group increased its scoring.

There was a decrease in scoring from 1967/68 to 1970 for the TTCT Activity 3 Flexibility factor in this case the scores for the Control group Females had decreased considerably.

For the Sex x Year Interaction in 1967/68 the Females scored higher than the Males, whereas in 1970 the Males scored higher than the Females for the TTCT Activity 2 Fluency and Flexibility factors; for the Flexibility factor however, the Experimental Females slightly increased their scoring in 1970.

For the Group x Sex Interaction the Control group Females scored higher than the Males for the Art Work 1 Spontaneous factor, whereas the Experimental group Males scored higher than the Females; although the difference was smaller in the case of the Experimental group.

For the Group x Sex x Year Interaction although the level of significance found for the Art Work 1 Spontaneous factor was  $p \leq .025$ , and the Experimental Males increased their scores from 1967/68 to 1970, this interaction did not influence the Group x Year interaction (found to be significant at the  $p \leq .025$  level).

In view of the very few significant differences between the means found for the above Main Effects and Interactions it would be unwise to make any assertions concerning them: although, for the Test factors in the Group x Year interaction the findings tend to reinforce findings in other sections of the analyses.

#### 11) Factors found significant in the Main Analyses

For the  $2 \times 2 \times 2 \times 24$  Overall ANOVA the differences between the means were found to be significant for the following Main Effects and Interactions (Table 19:3p. 271):

Sex, Group x Year, Tests, Sex x Tests and Group x Sex x Year x Tests.

Subsidiary analyses revealed details for these Effects and interactions.

The following is a summary of the findings for the above Main Effects and Interactions:

### Sex

In general Females score higher than Males. They are more creative as measured by the Art Work judgements for Gestalt, Originality and Involvement. Females are more Fluent and Elaborative as measured by the TTCT - though not necessarily more Original or Flexible - than Males.

There were no differences between the Males and Females for Creativity and Extraversion, as measured in the Personality Test, and very little difference between them for the Spontaneous factor in the Art Work judgements.

### Group x Year

The Experimental group increased its scoring from 1967/68 to 1970 in eighteen out of the twenty-four tests; particularly in the Originality factor as measured by the TTCT and Art Work judgements. The control group's scores were either similar in 1967/68 and 1970 or decreased from 1967/68 to 1970.

It was noted that the Experimental group had increased in scoring from 1967/68 to 1970 for the TTCT Total Elaboration factor.

### Tests.

Great differences were found, as was expected, due to the variety of tests and methods of scoring.

### Sex x Tests

Females in general scored higher than Males in nineteen out of the twenty-four Tests (significantly so in eleven of the Tests). Males scored higher than Females in the Creativity and Exvia factors of the Personality Test, and in the TTCT Activity 2 Originality factor. The Males and Females were similar in the cases of the TTCT Activity 2 Fluency and Flexibility.

### Group x Sex x Year x Tests

The Experimental group had improved from 1967/68 to 1970, particularly in the Originality factor, as measured by the TTCT and the Art Work Judgements. The scores for the Control group were similar in both 1967/68 and 1970, or had deteriorated from 1967/68 to 1970. Females generally scored higher than Males.

#### SECTION FOUR: BRIEF SUMMARY OF ALL ANALYSES

This section is a brief summary of the major findings from the analyses discussed in Section One, Two and Three of this Chapter.

1. It is not possible to state that there is a relationship between the Personality Test scores and the TTCT & Art Work Judgements; although correlations were found, for certain groups and tests, that did reach the accepted levels of significance.
2. There are grounds for considering that the TTCT - particularly the measurements for Originality and Elaboration - may be a valid indicator of creative ability in the visual arts, as measured by the Gestalt, Originality and Involvement factors of the Art Work judgements.
3. The Fluency, Flexibility, Originality and Elaboration factors of the Creativity Test (TTCT) are related but distinguishable, one from another. The Gestalt, Originality and Involvement factors of the Art Work judgements are more strongly related and less distinguishable from each other. The Spontaneous Art Work judgement is not strongly related to the three other judgements.
4. The Art Work judgements can be considered reliable; particularly the judgements of the Originality and Involvement factors.
5. Females score higher than Males in the Art Works Gestalt, Originality and Involvement factors. They were also more Fluent and Elaborative than Males, although not necessarily more Flexible or Original, as measured by the Creativity Tests (TTCT).  
  
The Creativity and Extraversion measures of the Personality Test and the Spontaneous Art Work judgement did not distinguish between Males and Females.
6. The Experimental Group increased its scores from 1967/68 to 1970 in 18 out of the 24 Tests, particularly for the Originality measures; whereas the Control Group did not increase its scores from 1967/68 to 1970.

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TABLE 19:6 MEANS FOR A (GROUPS), B (SEX), C (YEAR) FOR D (TESTS)

The Means are given for Control and Experimental groups: Male and Female subjects: 1967/68 and 1970 for the Twenty-Four Tests.

TEST D No.	CONTROL GROUP				EXPERIMENTAL GROUP			
	MALES		FEMALES		MALES		FEMALES	
	67/68	1970	67/68	1970	67/68	1970	67/68	1970
1	62.73	67.82	60.00	64.00	60.80	65.50	65.58	59.42
2	28.55	33.82	30.50	36.88	34.10	36.60	26.00	35.67
3	2.45	0.91	3.63	1.38	1.50	2.00	2.67	1.92
4	16.91	14.27	16.62	16.50	15.40	15.00	13.00	20.92
5	7.00	7.55	8.13	5.75	6.70	7.50	7.50	7.17
6	6.18	6.82	6.88	5.13	5.60	6.70	6.50	6.67
7	8.00	9.36	8.62	6.63	7.00	10.40	6.67	8.50
8	16.00	20.64	28.13	25.75	19.20	20.10	17.75	28.08
9	8.55	7.73	11.50	8.37	9.00	8.60	11.83	11.42
10	7.45	6.45	9.38	6.25	8.00	7.00	9.17	8.33
11	13.00	12.36	16.62	12.75	12.40	13.70	14.08	17.83
12	17.82	19.09	32.75	27.75	18.70	18.40	21.42	23.58
13	15.64	15.27	19.62	14.12	15.70	16.10	19.33	18.58
14	13.73	13.27	16.25	11.37	13.60	13.70	15.67	15.00
15	23.45	22.64	28.87	20.75	20.90	26.10	23.42	28.25
16	50.73	55.82	77.50	70.00	53.30	54.50	53.00	73.42
17	4.55	4.18	6.25	6.25	4.00	5.30	5.25	7.08
18	4.27	2.91	4.25	6.00	4.40	5.40	4.42	4.42
19	4.45	4.55	7.63	8.50	3.40	5.60	4.83	7.92
20	3.09	3.36	6.00	6.00	3.00	4.50	4.58	5.58
21	4.45	3.45	6.38	6.88	5.10	5.10	5.92	6.58
22	4.00	4.36	3.75	5.63	4.10	4.30	4.75	4.67
23	5.27	5.09	7.88	8.13	5.20	5.80	5.33	8.00
24	3.55	3.55	6.25	6.13	3.30	4.50	5.08	5.58

TEST NUMBERS AND GROUPINGS OF TESTS FOR ANALYSES OF RESULTS

The Main Effects and Interactions - B, AC, D, BD & ABCD were examined and analysed in the following groupings of Tests.

A = Group, B = Sex, C = Year and D = Tests.

TEST No. D	TEST IDENTIFICATION	GROUP TITLE	GROUP No.
1	CPQ/HSPQ Creativity	PERSONALITY TEST	GROUP 1
2	" "	" "	
3	TTCT ACT. 1 Originality	CREATIVITY TESTS (with the exception of those in Group 4)	GROUP 2
4	" " " Elaboration		
5	" ACT. 2 Fluency		
6	" " " Flexibility		
7	" " " Originality		
8	" " " Elaboration		
9	TTCT ACT. 3 Fluency		
10	" " " Flexibility		
11	" " " Originality		
12	" " " Elaboration		
13	TTCT TOTAL Fluency		
14	" " Flexibility		
17	ART WORK 1 Gestalt	ART WORK JUDGEMENTS (with the exception of those in Group 4)	GROUP 3
18	" " " Spontaneous		
21	ART WORK 2 Gestalt		
22	" " " Spontaneous		
15	TTCT TOTAL Originality	TESTS OF MAIN INTEREST in detecting any change in creative ability	GROUP 4
16	" " Elaboration		
19	ART WORK 1 Originality		
20	" " Involvement		
23	ART WORK 2 Originality		
24	" " Involvement		

CONCLUSION

This final Chapter is concerned with the conclusions reached regarding the Study to test Hypothesis B. This Hypothesis, in its 'null' form, was stated as "Following the administration of a creativity programme, there will be no difference between the means of pre-test and post-test scores on creativity measures of male and female, control and experimental groups."

Some conclusions regarding the 'internal assessment' of the 'creativity programme' were discussed at the end of Chapter Seventeen. As stated there the 'internal assessment', even if it had resulted in a satisfactory internal evaluation, could not provide evidence concerning the effectiveness of the programme in increasing creative ability. Experimental methods were therefore used to test the effectiveness of the creativity programme.

The study to test Hypothesis B involved the use of pre-tests and post-tests in an experimental situation. The pre-tests and post-tests used were the CPQ/HSPQ, the TTCT and the Art Work Judgements (24 Test items in all). Some of these test items, i.e. the TTCT Originality and Elaboration factors and the Art Work Gestalt, Originality and Involvement judgements, were found to be valid and reliable in the study to test Hypothesis A. This validity and reliability, as indicators of levels of creative ability, was confirmed in this later study. If the differences between the means for these valid tests items of the pre-tests and post-tests were found to be significant, following the experimental situation in which the creativity programme was administered, this would provide grounds for rejecting the 'null' Hypothesis.

A few points of interest concerning the measures used for the pre-test and post-tests were noted.

The lack of any certain relationship between creativity, as measured by the Torrance Tests of Creative Thinking and the Art Work Judgements, and Creativity by the second order Creativity and Exvia factors of the Personality Test (CPQ/HSPQ), was disappointing and surprising. The patterns of relationships that were noted were confused. There was some indication that the

relationships for the TTCT and the Art Work judgements with the Personality Test Creativity factor tended to be negative: whereas the relationships with the Personality Test Exvia factor tended to be positive.

In view of the fact that the majority of correlations were found to be non-significant however, no firm conclusions could be drawn regarding these relationships.

The strong relationships found among the Gestalt, Originality and Involvement factors of the Art Works judgements indicate that they are probably measuring the same basic factor. The relationship between the objective type Originality and Involvement judgements was particularly strong, and it is felt that it may be possible to combine and streamline these measures into one 'creativity measure'.

The fact that the Gestalt judgement also bore a strong relationship to the Originality and Involvement judgements was encouraging. It indicates, though does not prove, that even such a subjective, 'instant' type of judgement of creativity may be valid and reliable.

No firm conclusion could be reached regarding the Spontaneous Art Work judgement. It did, however, appear to have some relationship with Fluency and Flexibility, as measured by the TTCT.

From the analyses of the data provided by the scores on the pre-tests in 1967/68 and the post-tests in 1970 for the male and female subjects in the control and experimental groups, two main effects were observed:

- a) Females generally scored higher than males in the Creativity Tests and Art Works.
- b) The scores for the experimental group had increased from the pre-test administration to the post-test administration, particularly in their scores for 'Originality': whereas the scores for the control group had not increased but had, in some cases, decreased.

From the first main effect it may be concluded that the female pupils involved in the study were more creative than the male pupils, as measured by the tests. Whilst it would be unwise to generalize from the findings

concerning the particular subjects involved to similar postulates for larger populations, there is evidence from other studies (e.g. MacKinnon:1962) that creative persons tend toward 'femininity' in their personalities. The fact that female pupils may be more creative than male pupils would, therefore, not be surprising.

The findings regarding the second main effect are those that are the major concern for testing Hypothesis B.

The findings regarding the 'control' group were puzzling. No conclusion was reached concerning the reasons for the decreases in scoring from 1967/68 to 1970 which were noted in a number of cases for the control group. Apart from the administration of the 'creativity programme' the conditions for the control and experimental groups throughout the period of the study were similar.

It is possible, though impossible to prove, that if the 'creativity programme' had not been administered to the experimental group that their scores also would have been lower in 1970 than in 1967/68.

The fact that the experimental group had increased its scores following the administration of the creativity programme does not prove beyond doubt that the creativity programme alone led to an increase in creative ability, as measured by the tests.

It might, therefore, be appropriate to be cautious in extrapolating from the results obtained, but the analyses of the data indicate that the Null Hypothesis "Following the administration of a creativity programme, there will be no difference between the means of the pre-test and post-test scores on creativity measures of male and female, control and experimental, groups." should be rejected at a number of points. There is variance to explain; and there are grounds for supposing that the difference which occurs between the control and experimental groups for the pre-test and post-test administration may be attributed to the intervening 'creativity programme'.



In view of this rejection of the Null Hypothesis it is felt that an answer can be given to the original question posed at the end of Chapter Two: "Can programmed instruction be effective in increasing creative ability: particularly in the visual field?" The answer may now be stated: "Probably yes; there is sufficient evidence to warrant further design and development of programmed instructional methods for increasing creative ability."

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THE END

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## APPENDIX

<u>TABLE OF CONTENTS</u>	PAGE No.'s
Example of a cartoon by Giles (showing symbolic vase)	1
PART ONE	
<u>TIMETABLE:</u> PAGE ONE: STUDY TO TEST HYPOTHESIS A '67/68	2
PAGE TWO: STUDY TO TEST HYPOTHESIS B '67/68 & '70	3
PART TWO	
<u>COMPLETE RAW SCORES:</u> LIST OF TABLES	4
DETAILS AND CONTENTS OF TABLES	5
TABLES 1 to 16	6- 21
PART THREE	
<u>EXAMPLES AND ILLUSTRATIONS:</u> CONTENTS	22
<u>TTCT:</u> EXAMPLES - INTRODUCTION	23
EXAMPLES OF TTCT (fifty-three pages)	24- 76
<u>ART WORKS:</u> ILLUSTRATIONS - INTRODUCTION	77
ILLUSTRATIONS OF ART WORKS (seven pages)	78- 84
<u>PROGRAMME FEEDBACK:</u> E.G.'s & ILLUSTRATIONS - INTRODUCTION	85
EXAMPLES AND ILLUSTRATIONS (twenty-five pages)	86-110
PART FOUR	
<u>SELECTED TABLES OF CORRELATIONS:</u> LIST OF CONTENTS	111
TABLES 1 to 7c: STUDY TO TEST HYPOTHESIS A	112-122
TABLES 8a to 12b: STUDY TO TEST HYPOTHESIS B	123-128
PART FIVE	
<u>GRAPHS:</u> LIST OF CONTENTS	129
GRAPHS: SETS ONE to EIGHT	130-149
PART SIX	
<u>GRAPHS OF ABCD (OVERALL INTERACTION)</u>	IN POCKET AT BACK
A set of twelve transparent graphs for comparisons.	
PART SEVEN	
<u>THE CREATIVITY PROGRAMME</u>	IN POCKET AT BACK
A sample of the 'Creativity Programme' as used in the study.	